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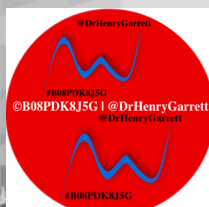
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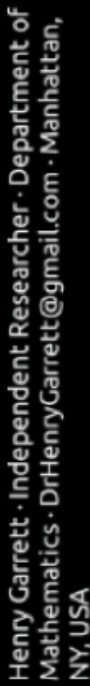
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In this scientific research book, there are some scientific research chapters on "Extreme SuperHyperNeutrosophic" and "Neutrosophic SuperHyperNeutrosophic" about some scientific researches on SuperHyperNeutrosophic by two (Extreme/Neutrosophic) notions, namely, Extreme SuperHyperNeutrosophic.....SuperHyperNeutrosophic.....With scientific researches on the basic properties, the scientific research book starts to make Extreme SuperHyperNeutrosophic theory and Neutrosophic SuperHyperNeutrosophic theory more (Extremely/Neutrosophically) understandable.

Some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in the following by Henry Garrett (2022) which is indexed by Google Scholar and has more than 3230 readers in Scitbd. It's titled "Beyond Neutrosophic Graphs" and published by Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United State. This research book covers different types of notions and settings in neutrosophic graph theory and neutrosophic SuperHyperGraph theory.

[Ref] Henry Garrett, (2022). "Beyond Neurotrophic Graphs", Ohio: E-publishing: Educational | Publisher 1091 West 1st Ave Grandview Heights, Ohio 43121 United States. ISBN: 978-1-59973-725-6 (<https://fs.unim.edu/BeyondNeurotrophicGraphs.pdf>).

Also, some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in the following by Henry Garrett (2022) which is indexed by Google Scholar and has more than 4117 readers in Scribd. It's titled "Neutrosophic Duality" and published by Florida: GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. This research book presents different types of notions SuperHyperResolving and SuperHyperDominating in the setting of duality in neutrosophic graph theory and neutrosophic SuperHyperGraph theory. This research book has scrutiny on the complement of the intended set and the intended set, simultaneously. It's smart to consider a set but acting on its complement that what's done in this research book which is popular in the terms of high readers in Scribd.

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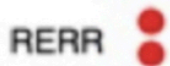
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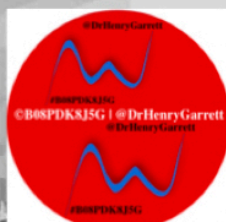
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# CHAPTER 1

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## ABSTRACT

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In this scientific research book, there are some scientific research chapters on “Extreme Vertex-Decomposition In SuperHyperGraphs” and “Neutrosophic Vertex-Decomposition In SuperHyperGraphs” about some scientific research on Vertex-Decomposition In SuperHyperGraphs by two (Extreme/Neutrosophic) notions, namely, Extreme Vertex-Decomposition In SuperHyperGraphs and Neutrosophic Vertex-Decomposition In SuperHyperGraphs. With scientific research on the basic scientific research properties, the scientific research book starts to make Extreme Vertex-Decomposition In SuperHyperGraphs theory and Neutrosophic Vertex-Decomposition In SuperHyperGraphs theory more (Extremely/Neutrosophicly) understandable.

In the some chapters, in some researches, new setting is introduced for new SuperHyperNotions, namely, a Vertex-Decomposition In SuperHyperGraphs and Neutrosophic Vertex-Decomposition In SuperHyperGraphs . Two different types of SuperHyperDefinitions are debut for them but the scientific research goes further and the SuperHyperNotion, SuperHyperUniform, and SuperHyperClass based on that are well-defined and well-reviewed. The literature review is implemented in the whole of this research. For shining the elegance and the significancy of this research, the comparison between this SuperHyperNotion with other SuperHyperNotions and fundamental SuperHyperNumbers are featured. The definitions are followed by the examples and the instances thus the clarifications are driven with different tools. The applications are figured out to make sense about the theoretical aspect of this ongoing research. The “Cancer’s Recognition” are the under scientific research to figure out the challenges make sense about ongoing and upcoming research. The special case is up. The cells are viewed in the deemed ways. There are different types of them. Some of them are individuals and some of them are well-modeled by the group of cells. These types are all officially called “SuperHyperVertex” but the relations amid them all officially called “SuperHyperEdge”. The frameworks “SuperHyperGraph” and “Neutrosophic SuperHyperGraph” are chosen and elected to scientific research about “Cancer’s Recognition”. Thus these complex and dense SuperHyperModels open up some avenues to scientific research on theoretical segments and “Cancer’s Recognition”. Some avenues are posed to pursue this research. It’s also officially collected in the form of some questions and some problems. Assume a SuperHyperGraph. Then  $\delta$ -Vertex-Decomposition In SuperHyperGraphs is a maximal of SuperHyperVertices with a maximum cardinality such that either of the following expressions hold for the (Neutrosophic) cardinalities of SuperHyperNeighbors of  $s \in S$  : there are  $|S \cap N(s)| > |S \cap (V \setminus N(s))| + \delta$ ; and  $|S \cap N(s)| < |S \cap (V \setminus N(s))| + \delta$ . The first Expression, holds if  $S$  is an  $\delta$ -SuperHyperOffensive. And the second Expression, holds if  $S$



is an  $\delta$ -SuperHyperDefensive; a Neutrosophic  $\delta$ -Vertex-Decomposition In SuperHyperGraphs is a maximal Neutrosophic of SuperHyperVertices with maximum Neutrosophic cardinality such that either of the following expressions hold for the Neutrosophic cardinalities of SuperHyperNeighbors of  $s \in S$  there are:  $|S \cap N(s)|_{Neutrosophic} > |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta$ ; and  $|S \cap N(s)|_{Neutrosophic} < |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta$ . The first Expression, holds if  $S$  is a Neutrosophic  $\delta$ -SuperHyperOffensive. And the second Expression, holds if  $S$  is a Neutrosophic  $\delta$ -SuperHyperDefensive It's useful to define a "Neutrosophic" version of a Vertex-Decomposition In SuperHyperGraphs . Since there's more ways to get type-results to make a Vertex-Decomposition In SuperHyperGraphs more understandable. For the sake of having Neutrosophic Vertex-Decomposition In SuperHyperGraphs, there's a need to "redefine" the notion of a "Vertex-Decomposition In SuperHyperGraphs ". The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of the position of labels to assign to the values. Assume a Vertex-Decomposition In SuperHyperGraphs . It's redefined a Neutrosophic Vertex-Decomposition In SuperHyperGraphs if the mentioned Table holds, concerning, "The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph" with the key points, "The Values of The Vertices & The Number of Position in Alphabet", "The Values of The SuperVertices&The maximum Values of Its Vertices", "The Values of The Edges&The maximum Values of Its Vertices", "The Values of The HyperEdges&The maximum Values of Its Vertices", "The Values of The SuperHyperEdges&The maximum Values of Its Endpoints". To get structural examples and instances, I'm going to introduce the next SuperHyperClass of SuperHyperGraph based on a Vertex-Decomposition In SuperHyperGraphs . It's the main. It'll be disciplinary to have the foundation of previous definition in the kind of SuperHyperClass. If there's a need to have all Vertex-Decomposition In SuperHyperGraphs until the Vertex-Decomposition In SuperHyperGraphs, then it's officially called a "Vertex-Decomposition In SuperHyperGraphs" but otherwise, it isn't a Vertex-Decomposition In SuperHyperGraphs . There are some instances about the clarifications for the main definition titled a "Vertex-Decomposition In SuperHyperGraphs ". These two examples get more scrutiny and discernment since there are characterized in the disciplinary ways of the SuperHyperClass based on a Vertex-Decomposition In SuperHyperGraphs . For the sake of having a Neutrosophic Vertex-Decomposition In SuperHyperGraphs, there's a need to "redefine" the notion of a "Neutrosophic Vertex-Decomposition In SuperHyperGraphs" and a "Neutrosophic Vertex-Decomposition In SuperHyperGraphs ". The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of the position of labels to assign to the values. Assume a Neutrosophic SuperHyperGraph. It's redefined "Neutrosophic SuperHyperGraph" if the intended Table holds. And a Vertex-Decomposition In SuperHyperGraphs are redefined to a "Neutrosophic Vertex-Decomposition In SuperHyperGraphs" if the intended Table holds. It's useful to define "Neutrosophic" version of SuperHyperClasses. Since there's more ways to get Neutrosophic type-results to make a Neutrosophic Vertex-Decomposition In SuperHyperGraphs more understandable. Assume a Neutrosophic SuperHyperGraph. There are some Neutrosophic SuperHyperClasses if the intended Table holds. Thus SuperHyperPath, Vertex-Decomposition In SuperHyperGraphs, SuperHyperStar, SuperHyperBipartite, SuperHyperMultiPartite, and SuperHyperWheel, are "Neutrosophic SuperHyperPath", "Neutrosophic Vertex-Decomposition In SuperHyperGraphs", "Neutrosophic SuperHyperStar", "Neutrosophic SuperHyperBipartite", "Neutrosophic SuperHyperMultiPartite", and "Neutrosophic SuperHyperWheel" if the intended Table holds. A

SuperHyperGraph has a “Neutrosophic Vertex-Decomposition In SuperHyperGraphs” where it’s the strongest [the maximum Neutrosophic value from all the Vertex-Decomposition In SuperHyperGraphs amid the maximum value amid all SuperHyperVertices from a Vertex-Decomposition In SuperHyperGraphs .] Vertex-Decomposition In SuperHyperGraphs . A graph is a SuperHyperUniform if it’s a SuperHyperGraph and the number of elements of SuperHyperEdges are the same. Assume a Neutrosophic SuperHyperGraph. There are some SuperHyperClasses as follows. It’s SuperHyperPath if it’s only one SuperVertex as intersection amid two given SuperHyperEdges with two exceptions; it’s Vertex-Decomposition In SuperHyperGraphs if it’s only one SuperVertex as intersection amid two given SuperHyperEdges; it’s SuperHyperStar it’s only one SuperVertex as intersection amid all SuperHyperEdges; it’s SuperHyperBipartite it’s only one SuperVertex as intersection amid two given SuperHyperEdges and these SuperVertices, forming two separate sets, has no SuperHyperEdge in common; it’s SuperHyperMultiPartite it’s only one SuperVertex as intersection amid two given SuperHyperEdges and these SuperVertices, forming multi separate sets, has no SuperHyperEdge in common; it’s a SuperHyperWheel if it’s only one SuperVertex as intersection amid two given SuperHyperEdges and one SuperVertex has one SuperHyperEdge with any common SuperVertex. The SuperHyperModel proposes the specific designs and the specific architectures. The SuperHyperModel is officially called “SuperHyperGraph” and “Neutrosophic SuperHyperGraph”. In this SuperHyperModel, The “specific” cells and “specific group” of cells are SuperHyperModeled as “SuperHyperVertices” and the common and intended properties between “specific” cells and “specific group” of cells are SuperHyperModeled as “SuperHyperEdges”. Sometimes, it’s useful to have some degrees of determinacy, indeterminacy, and neutrality to have more precise SuperHyperModel which in this case the SuperHyperModel is called “Neutrosophic”. In the future research, the foundation will be based on the “Cancer’s Recognition” and the results and the definitions will be introduced in redeemed ways. The recognition of the cancer in the long-term function. The specific region has been assigned by the model [it’s called SuperHyperGraph] and the long cycle of the move from the cancer is identified by this research. Sometimes the move of the cancer hasn’t be easily identified since there are some determinacy, indeterminacy and neutrality about the moves and the effects of the cancer on that region; this event leads us to choose another model [it’s said to be Neutrosophic SuperHyperGraph] to have convenient perception on what’s happened and what’s done. There are some specific models, which are well-known and they’ve got the names, and some SuperHyperGeneral SuperHyperModels. The moves and the traces of the cancer on the complex tracks and between complicated groups of cells could be fantasized by a Neutrosophic SuperHyperPath(-/Vertex-Decomposition In SuperHyperGraphs, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the longest Vertex-Decomposition In SuperHyperGraphs or the strongest Vertex-Decomposition In SuperHyperGraphs in those Neutrosophic SuperHyperModels. For the longest Vertex-Decomposition In SuperHyperGraphs, called Vertex-Decomposition In SuperHyperGraphs, and the strongest Vertex-Decomposition In SuperHyperGraphs, called Neutrosophic Vertex-Decomposition In SuperHyperGraphs, some general results are introduced. Beyond that in SuperHyperStar, all possible SuperHyperPaths have only two SuperHyperEdges but it’s not enough since it’s essential to have at least three SuperHyperEdges to form any style of a Vertex-Decomposition In SuperHyperGraphs. There isn’t any formation of any Vertex-Decomposition In SuperHyperGraphs but literarily, it’s the deformation of any Vertex-Decomposition In SuperHyperGraphs. It, literarily, deforms and it doesn’t form. A basic familiarity with SuperHyperGraph theory and Neutrosophic SuperHyperGraph theory are

proposed.

**Keywords:** SuperHyperGraph, (Neutrosophic) Vertex-Decomposition In SuperHyperGraphs,

Cancer's Recognition

**AMS Subject Classification:** 05C17, 05C22, 05E45

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**Keywords:** Neutrosophic SuperHyperGraph, Neutrosophic Vertex-Decomposition In Super-

HyperGraphs, Cancer’s Neutrosophic Recognition

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Some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in the following by Henry Garrett (2022) which is indexed by Google Scholar and has more than 3181 readers in Scribd. It’s titled “Beyond Neutrosophic Graphs” and published by Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United State. This research book covers different types of notions and settings in neutrosophic graph theory and neutrosophic SuperHyperGraph theory.

[Ref] Henry Garrett, (2022). “*Beyond Neutrosophic Graphs*”, Ohio: E-publishing: Edu-



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## Beyond Neutrosophic Graphs

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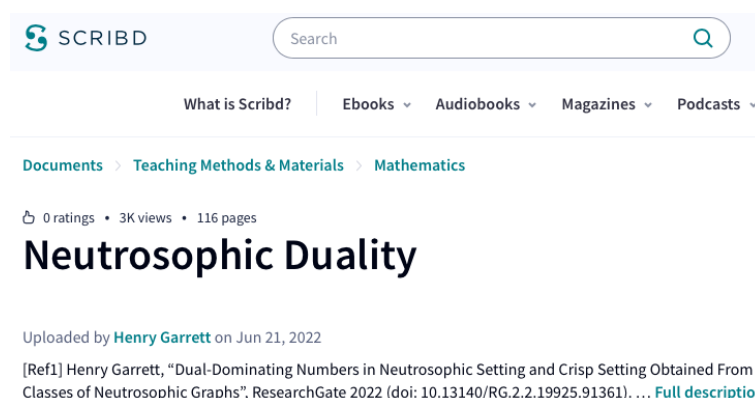
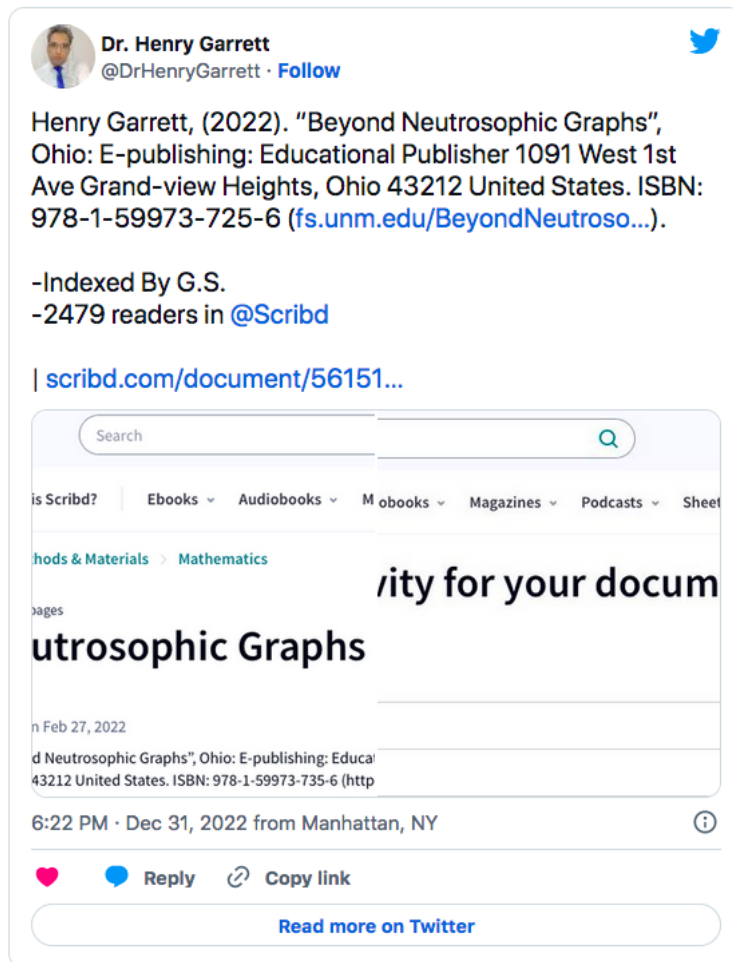
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[Ref] Henry Garrett, (2022). “*Neutrosophic Duality*”, Florida: GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. ISBN: 978-1-59973-743-0 (<http://fs.unm.edu/NeutrosophicDuality.pdf>).

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# Neutrosophic Duality

on Jun 21, 2022

Dominating Numbers in Neutrosophic Setting and Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.1991.1)

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## CHAPTER 2

284

### Background

285

There are some scientific researches covering the topic of this research. In what follows, there are some discussion and literature reviews about them.

The seminal paper and groundbreaking article is titled “neutrosophic co-degree and neutrosophic degree alongside chromatic numbers in the setting of some classes related to neutrosophic hypergraphs” in **Ref. [HG1]** by Henry Garrett (2022). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on general forms without using neutrosophic classes of neutrosophic SuperHyperGraph. It’s published in prestigious and fancy journal is entitled “Journal of Current Trends in Computer Science Research (JCTCSR)” with ISO abbreviation “J Curr Trends Comp Sci Res” in volume 1 and issue 1 with pages 06-14. The research article studies deeply with choosing neutrosophic hypergraphs instead of neutrosophic SuperHyperGraph. It’s the breakthrough toward independent results based on initial background.

The seminal paper and groundbreaking article is titled “Super Hyper Dominating and Super Hyper Resolving on Neutrosophic Super Hyper Graphs and Their Directions in Game Theory and Neutrosophic Super Hyper Classes” in **Ref. [HG2]** by Henry Garrett (2022). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on fundamental SuperHyperNumber and using neutrosophic SuperHyperClasses of neutrosophic SuperHyperGraph. It’s published in prestigious and fancy journal is entitled “Journal of Mathematical Techniques and Computational Mathematics(JMTCM)” with ISO abbreviation “J Math Techniques Comput Math” in volume 1 and issue 3 with pages 242-263. The research article studies deeply with choosing directly neutrosophic SuperHyperGraph and SuperHyperGraph. It’s the breakthrough toward independent results based on initial background and fundamental SuperHyperNumbers.

The seminal paper and groundbreaking article is titled “Some Super Hyper Degrees and Co-Super Hyper Degrees on Neutrosophic Super Hyper Graphs And Super Hyper Graphs Alongside Applications in Cancer’s Treatments” in **Ref. [HG3]** by Henry Garrett (2023). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on fundamental notions and using vital tools in Cancer’s Treatments. It’s published in prestigious and fancy journal is entitled “Journal of Mathematical Techniques and Computational Mathematics(JMTCM)” with ISO abbreviation “J Math Techniques Comput Math” in volume 2 and issue 1 with pages 35-47. The research article studies deeply with choosing directly neutrosophic SuperHyperGraph and SuperHyperGraph. It’s the breakthrough toward independent results based on initial background and fundamental SuperHyperNumbers.



In some articles are titled “0039 | Closing Numbers and Super-Closing Numbers as  
(Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-  
SuperHyperGraph” in **Ref. [HG4]** by Henry Garrett (2022), “0049 | (Failed)1-Zero-Forcing  
Number in Neutrosophic Graphs” in **Ref. [HG5]** by Henry Garrett (2022), “Extreme SuperHy-  
perClique as the Firm Scheme of Confrontation under Cancer’s Recognition as the Model in  
The Setting of (Neutrosophic) SuperHyperGraphs” in **Ref. [HG6]** by Henry Garrett (2022),  
“Uncertainty On The Act And Effect Of Cancer Alongside The Foggy Positions Of Cells Toward  
Neutrosophic Failed SuperHyperClique inside Neutrosophic SuperHyperGraphs Titled Cancer’s  
Recognition” in **Ref. [HG7]** by Henry Garrett (2022), “Neutrosophic Version Of Separates  
Groups Of Cells In Cancer’s Recognition On Neutrosophic SuperHyperGraphs” in **Ref. [HG8]**  
by Henry Garrett (2022), “The Shift Paradigm To Classify Separately The Cells and Affected  
Cells Toward The Totality Under Cancer’s Recognition By New Multiple Definitions On the  
Sets Polynomials Alongside Numbers In The (Neutrosophic) SuperHyperMatching Theory  
Based on SuperHyperGraph and Neutrosophic SuperHyperGraph” in **Ref. [HG9]** by Henry  
Garrett (2022), “Breaking the Continuity and Uniformity of Cancer In The Worst Case of  
Full Connections With Extreme Failed SuperHyperClique In Cancer’s Recognition Applied in  
(Neutrosophic) SuperHyperGraphs” in **Ref. [HG10]** by Henry Garrett (2022), “Neutrosophic  
Failed SuperHyperStable as the Survivors on the Cancer’s Neutrosophic Recognition Based  
on Uncertainty to All Modes in Neutrosophic SuperHyperGraphs” in **Ref. [HG11]** by Henry  
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**HG186; HG187; HG188; HG189; HG190; HG191; HG192; HG193; HG194; HG195; HG196; HG197; HG198; HG199; HG200; HG201**], there are some endeavors to formalize the basic SuperHyperNotions about neutrosophic SuperHyperGraph and SuperHyperGraph. Some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in **Ref. [HG39]** by Henry Garrett (2022) which is indexed by Google Scholar and has more than 3230 readers in Scribd. It's titled "Beyond Neutrosophic Graphs" and published by Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United State. This research book covers different types of notions and settings in neutrosophic graph theory and neutrosophic SuperHyperGraph theory.

Also, some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in **Ref. [HG40]** by Henry Garrett (2022) which is indexed by Google Scholar and has more than 4117 readers in Scribd. It's titled "Neutrosophic Duality" and published by Florida: GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. This research book presents different types of notions SuperHyperResolving and SuperHyperDominating in the setting of duality in neutrosophic graph theory and neutrosophic SuperHyperGraph theory. This research book has scrutiny on the complement of the intended set and the intended set, simultaneously. It's smart to consider a set but acting on its complement that what's done in this research book which is popular in the terms of high readers in Scribd.

See the seminal scientific researches [**HG1; HG2; HG3**]. The formalization of the notions on the framework of notions in SuperHyperGraphs, Neutrosophic notions in SuperHyperGraphs theory, and (Neutrosophic) SuperHyperGraphs theory at [**HG4; HG5; HG6; HG7; HG8; HG9; HG10; HG11; HG12; HG13; HG14; HG15; HG16; HG17; HG18; HG19; HG20; HG21; HG22; HG23; HG24; HG25; HG26; HG27; HG28; HG29; HG30; HG31; HG32; HG33; HG34; HG35; HG36; HG37; HG38; HG94; HG942; HG95; HG952; HG96; HG962; HG97; HG972; HG98; HG982; HG106; HG107; HG111; HG112; HG115; HG116; HG120; HG121; HG122; HG123; HG124; HG125; HG126; HG127; HG128; HG129; HG130; HG131; HG132; HG134; HG135; HG136; HG137; HG138; HG139; HG140; HG141; HG142; HG143; HG144; HG145; HG146; HG147; HG148; HG149; HG150; HG151; HG152; HG153; HG154; HG155; HG156; HG157; HG158; HG159; HG160; HG161; HG162; HG163; HG164; HG165; HG166; HG167; HG168; HG169; HG170; HG171; HG172; HG173; HG174; HG175; HG176; HG177; HG178; HG179; HG180; HG181; HG182; HG183; HG184; HG185; HG186; HG187; HG188; HG189; HG190; HG191; HG192; HG193; HG194; HG195; HG196; HG197; HG198; HG199; HG200; HG201**]. Two popular scientific research books in Scribd in the terms of high readers, 3230 and 4117 respectively, on neutrosophic science is on [**HG39; HG40**].

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## CHAPTER 3

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## Cancer In Extreme SuperHyperGraph

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The cancer is the Extreme disease but the Extreme model is going to figure out what's going on this Extreme phenomenon. The special Extreme case of this Extreme disease is considered and as the consequences of the model, some parameters are used. The cells are under attack of this disease but the moves of the cancer in the special region are the matter of mind. The Extreme recognition of the cancer could help to find some Extreme treatments for this Extreme disease. In the following, some Extreme steps are Extreme devised on this disease.

**Step 1. (Extreme Definition)** The Extreme recognition of the cancer in the long-term Extreme function.

**Step 2. (Extreme Issue)** The specific region has been assigned by the Extreme model [it's called Extreme SuperHyperGraph] and the long Extreme cycle of the move from the cancer is identified by this research. Sometimes the move of the cancer hasn't be easily identified since there are some determinacy, indeterminacy and neutrality about the moves and the effects of the cancer on that region; this event leads us to choose another model [it's said to be Extreme SuperHyperGraph] to have convenient perception on what's happened and what's done.

**Step 3. (Extreme Model)** There are some specific Extreme models, which are well-known and they've got the names, and some general Extreme models. The moves and the Extreme traces of the cancer on the complex tracks and between complicated groups of cells could be fantasized by an Extreme SuperHyperPath(-/SuperHyperK-Domination, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the Extreme SuperHyperK-Domination or the Extreme SuperHyperK-Domination in those Extreme Extreme SuperHyperModels.

Some cells have been faced with some attacks from the situation which is caused by the cancer's attacks. In this case, there are some embedded analysis on the ongoing situations which in that, the cells could be labelled as some groups and some groups or individuals have excessive labels which all are raised from the behaviors to overcome the cancer's attacks. In the embedded situations, the individuals of cells and the groups of cells could be considered as "new groups". Thus it motivates us to find the proper SuperHyperModels for getting more proper analysis on this messy story. I've found the SuperHyperModels which are officially called "SuperHyperGraphs" and "Extreme SuperHyperGraphs". In this SuperHyperModel, the cells and the groups of cells are defined as "SuperHyperVertices" and the relations between

the individuals of cells and the groups of cells are defined as “SuperHyperEdges”. Thus it’s another motivation for us to do research on this SuperHyperModel based on the “Cancer’s Recognition”. Sometimes, the situations get worst. The situation is passed from the certainty and precise style. Thus it’s the beyond them. There are three descriptions, namely, the degrees of determinacy, indeterminacy and neutrality, for any object based on vague forms, namely, incomplete data, imprecise data, and uncertain analysis. The latter model could be considered on the previous SuperHyperModel. It’s SuperHyperModel. It’s SuperHyperGraph but it’s officially called “Extreme SuperHyperGraphs”. The cancer is the disease but the model is going to figure out what’s going on this phenomenon. The special case of this disease is considered and as the consequences of the model, some parameters are used. The cells are under attack of this disease but the moves of the cancer in the special region are the matter of mind. The recognition of the cancer could help to find some treatments for this disease. The SuperHyperGraph and Extreme SuperHyperGraph are the SuperHyperModels on the “Cancer’s Recognition” and both bases are the background of this research. Sometimes the cancer has been happened on the region, full of cells, groups of cells and embedded styles. In this segment, the SuperHyperModel proposes some SuperHyperNotions based on the connectivities of the moves of the cancer in the forms of alliances’ styles with the formation of the design and the architecture are formally called “ SuperHyperK-Domination” in the themes of jargons and buzzwords. The prefix “SuperHyper” refers to the theme of the embedded styles to figure out the background for the SuperHyperNotions. The recognition of the cancer in the long-term function. The specific region has been assigned by the model [it’s called SuperHyperGraph] and the long cycle of the move from the cancer is identified by this research. Sometimes the move of the cancer hasn’t be easily identified since there are some determinacy, indeterminacy and neutrality about the moves and the effects of the cancer on that region; this event leads us to choose another model [it’s said to be Extreme SuperHyperGraph] to have convenient perception on what’s happened and what’s done. There are some specific models, which are well-known and they’ve got the names, and some general models. The moves and the traces of the cancer on the complex tracks and between complicated groups of cells could be fantasized by an Extreme SuperHyperPath (-/SuperHyperK-Domination, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the optimal SuperHyperK-Domination or the Extreme SuperHyperK-Domination in those Extreme SuperHyperModels. Some general results are introduced. Beyond that in SuperHyperStar, all possible Extreme SuperHyperPath s have only two SuperHyperEdges but it’s not enough since it’s essential to have at least three SuperHyperEdges to form any style of a SuperHyperK-Domination. There isn’t any formation of any SuperHyperK-Domination but literarily, it’s the deformation of any SuperHyperK-Domination. It, literarily, deforms and it doesn’t form.

**Question 4.0.1.** *How to define the SuperHyperNotions and to do research on them to find the “amount of SuperHyperK-Domination” of either individual of cells or the groups of cells based on the fixed cell or the fixed group of cells, extensively, the “amount of SuperHyperK-Domination” based on the fixed groups of cells or the fixed groups of group of cells?*

**Question 4.0.2.** *What are the best descriptions for the “Cancer’s Recognition” in terms of these messy and dense SuperHyperModels where embedded notions are illustrated?*

It’s motivation to find notions to use in this dense model is titled “SuperHyperGraphs”. Thus it motivates us to define different types of “ SuperHyperK-Domination” and “Extreme SuperHyperK-Domination” on “SuperHyperGraph” and “Extreme SuperHyperGraph”. Then the

research has taken more motivations to define SuperHyperClasses and to find some connections 972  
amid this SuperHyperNotion with other SuperHyperNotions. It motivates us to get some 973  
instances and examples to make clarifications about the framework of this research. The general 974  
results and some results about some connections are some avenues to make key point of this 975  
research, “Cancer’s Recognition”, more understandable and more clear. 976  
Some SuperHyperClasses and some Extreme SuperHyperClasses are the cases of this research 977  
on the modeling of the regions where are under the attacks of the cancer to recognize 978  
this disease as it’s mentioned on the title “Cancer’s Recognitions”. To formalize the 979  
instances on the SuperHyperNotion, SuperHyperK-Domination, the new SuperHyperClasses 980  
and SuperHyperClasses, are introduced. Some general results are gathered in the section on 981  
the SuperHyperK-Domination and the Extreme SuperHyperK-Domination. The clarifications, 982  
instances and literature reviews have taken the whole way through. In this scientific research, 983  
the literature reviews have fulfilled the lines containing the notions and the results. The 984  
SuperHyperGraph and Extreme SuperHyperGraph are the SuperHyperModels on the “Cancer’s 985  
Recognitions” and both bases are the background of this research. Sometimes the cancer has 986  
been happened on the region, full of cells, groups of cells and embedded styles. In this scientific 987  
segment, the SuperHyperModel proposes some SuperHyperNotions based on the connectivities 988  
of the moves of the cancer in the longest and strongest styles with the formation of the design 989  
and the architecture are formally called “ SuperHyperK-Domination” in the themes of jargons 990  
and buzzwords. The prefix “SuperHyper” refers to the theme of the embedded styles to figure 991  
out the background for the SuperHyperNotions. 992



## Extreme Vertex-Decomposition

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10.13140/RG.2.2.13121.84321). 1030



## CHAPTER 6

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<b>New Ideas On Super Decomensation By</b>	1032
<b>Hyper Decompress Of</b>	1033
<b>Vertex-Decomposition In Cancer's</b>	1034
<b>Recognition With (Neutrosophic)</b>	1035
<b>SuperHyperGraph</b>	1036

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## CHAPTER 7

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### ABSTRACT

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In this scientific research, (Different Neutrosophic Types of Neutrosophic SuperHyperVertex-  
Decomposition). Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a Vertex-  
Decomposition pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$   
and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called Neutrosophic e-SuperHyperVertex-  
Decomposition if the following expression is called Neutrosophic e-SuperHyperVertex-  
Decomposition criteria holds

$$\forall E' : E' \text{ is disconnect-able;}$$

Neutrosophic re-SuperHyperVertex-Decomposition if the following expression is called Neutro-  
sophic e-SuperHyperVertex-Decomposition criteria holds

$$\forall E' : E' \text{ is disconnect-able;}$$

and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; Neutrosophic v-  
SuperHyperVertex-Decomposition if the following expression is called Neutrosophic v-  
SuperHyperVertex-Decomposition criteria holds

$$\forall V' : V' \text{ is disconnect-able;}$$

Neutrosophic rv-SuperHyperVertex-Decomposition if the following expression is called Neutro-  
sophic v-SuperHyperVertex-Decomposition criteria holds

$$\forall V' : V' \text{ is disconnect-able;}$$

and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; Neutrosophic  
SuperHyperVertex-Decomposition if it's either of Neutrosophic e-SuperHyperVertex-  
Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-  
SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition.  
((Neutrosophic) SuperHyperVertex-Decomposition). Assume a Neutrosophic SuperHyper-  
Graph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperEdge (NSHE)  
 $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called an Extreme SuperHyperVertex-Decomposition if it's  
either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-  
Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-  
SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph

$NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; a Neutrosophic SuperHyperVertex-Decomposition if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; an Extreme SuperHyperVertex-Decomposition SuperHyperPolynomial if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; and the Extreme power is corresponded to its Extreme coefficient; a Neutrosophic SuperHyperVertex-Decomposition SuperHyperPolynomial if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic power is corresponded to its Neutrosophic coefficient; an Extreme V-SuperHyperVertex-Decomposition if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; a Neutrosophic V-SuperHyperVertex-Decomposition if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; an Extreme V-SuperHyperVertex-Decomposition SuperHyperPolynomial if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-

Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the 1108  
Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme 1109  
number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme 1110  
SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges 1111  
and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex- 1112  
Decomposition; and the Extreme power is corresponded to its Extreme coefficient; a Neutro- 1113  
sophic SuperHyperVertex-Decomposition SuperHyperPolynomial if it's either of Neutro- 1114  
sophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, 1115  
Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex- 1116  
Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is 1117  
the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as 1118  
the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic 1119  
SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conse- 1120  
Neighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that 1121  
they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic power is 1122  
corresponded to its Neutrosophic coefficient. In this scientific research, new setting is introduced 1123  
for new SuperHyperNotions, namely, a SuperHyperVertex-Decomposition and Neutrosophic 1124  
SuperHyperVertex-Decomposition. Two different types of SuperHyperDefinitions are debut 1125  
for them but the research goes further and the SuperHyperNotion, SuperHyperUniform, and 1126  
SuperHyperClass based on that are well-defined and well-reviewed. The literature review is 1127  
implemented in the whole of this research. For shining the elegance and the significancy of this 1128  
research, the comparison between this SuperHyperNotion with other SuperHyperNotions and 1129  
fundamental SuperHyperNumbers are featured. The definitions are followed by the examples 1130  
and the instances thus the clarifications are driven with different tools. The applications are 1131  
figured out to make sense about the theoretical aspect of this ongoing research. The “Cancer’s 1132  
Recognition” are the under research to figure out the challenges make sense about ongoing and 1133  
upcoming research. The special case is up. The cells are viewed in the deemed ways. There are 1134  
different types of them. Some of them are individuals and some of them are well-modeled by 1135  
the group of cells. These types are all officially called “SuperHyperVertex” but the relations 1136  
amid them all officially called “SuperHyperEdge”. The frameworks “SuperHyperGraph” and 1137  
“Neutrosophic SuperHyperGraph” are chosen and elected to research about “Cancer’s Recognition” 1138  
Thus these complex and dense SuperHyperModels open up some avenues to research 1139  
on theoretical segments and “Cancer’s Recognition”. Some avenues are posed to pursue this 1140  
research. It’s also officially collected in the form of some questions and some problems. Assume 1141  
a SuperHyperGraph. Assume a SuperHyperGraph. Then  $\delta$ -SuperHyperVertex-Decomposition 1142  
is a maximal of SuperHyperVertices with a maximum cardinality such that either of the 1143  
following expressions hold for the (Neutrosophic) cardinalities of SuperHyperNeighbors of 1144  
 $s \in S$  : there are  $|S \cap N(s)| > |S \cap (V \setminus N(s))| + \delta$ ; and  $|S \cap N(s)| < |S \cap (V \setminus N(s))| + \delta$ . The 1145  
first Expression, holds if  $S$  is an  $\delta$ -SuperHyperOffensive. And the second Expression, holds 1146  
if  $S$  is an  $\delta$ -SuperHyperDefensive; a Neutrosophic  $\delta$ -SuperHyperVertex-Decomposition is 1147  
a maximal Neutrosophic of SuperHyperVertices with maximum Neutrosophic cardinality 1148  
such that either of the following expressions hold for the Neutrosophic cardinalities of Super- 1149  
HyperNeighbors of  $s \in S$  there are:  $|S \cap N(s)|_{Neutrosophic} > |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta$ ; 1150  
and  $|S \cap N(s)|_{Neutrosophic} < |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta$ . The first Expression, holds 1151  
if  $S$  is a Neutrosophic  $\delta$ -SuperHyperOffensive. And the second Expression, holds if  $S$  is 1152  
a Neutrosophic  $\delta$ -SuperHyperDefensive It’s useful to define a “Neutrosophic” version of 1153

a SuperHyperVertex-Decomposition . Since there's more ways to get type-results to make 1154  
a SuperHyperVertex-Decomposition more understandable. For the sake of having Neut- 1155  
rosophic SuperHyperVertex-Decomposition, there's a need to "redefine" the notion of a 1156  
"SuperHyperVertex-Decomposition ". The SuperHyperVertices and the SuperHyperEdges are 1157  
assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of 1158  
the position of labels to assign to the values. Assume a SuperHyperVertex-Decomposition . 1159  
It's redefined a Neutrosophic SuperHyperVertex-Decomposition if the mentioned Table holds, 1160  
concerning, "The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges 1161  
Belong to The Neutrosophic SuperHyperGraph" with the key points, "The Values of The 1162  
Vertices & The Number of Position in Alphabet", "The Values of The SuperVertices&The 1163  
maximum Values of Its Vertices", "The Values of The Edges&The maximum Values of Its 1164  
Vertices", "The Values of The HyperEdges&The maximum Values of Its Vertices", "The 1165  
Values of The SuperHyperEdges&The maximum Values of Its Endpoints". To get structural 1166  
examples and instances, I'm going to introduce the next SuperHyperClass of SuperHyperGraph 1167  
based on a SuperHyperVertex-Decomposition . It's the main. It'll be disciplinary to have 1168  
the foundation of previous definition in the kind of SuperHyperClass. If there's a need 1169  
to have all SuperHyperVertex-Decomposition until the SuperHyperVertex-Decomposition, 1170  
then it's officially called a "SuperHyperVertex-Decomposition" but otherwise, it isn't a 1171  
SuperHyperVertex-Decomposition . There are some instances about the clarifications for the 1172  
main definition titled a "SuperHyperVertex-Decomposition ". These two examples get more 1173  
scrutiny and discernment since there are characterized in the disciplinary ways of the SuperHy- 1174  
perClass based on a SuperHyperVertex-Decomposition . For the sake of having a Neutrosophic 1175  
SuperHyperVertex-Decomposition, there's a need to "redefine" the notion of a "Neutrosophic 1176  
SuperHyperVertex-Decomposition" and a "Neutrosophic SuperHyperVertex-Decomposition ". 1177  
The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of 1178  
the alphabets. In this procedure, there's the usage of the position of labels to assign to the values. 1179  
Assume a Neutrosophic SuperHyperGraph. It's redefined "Neutrosophic SuperHyperGraph" if 1180  
the intended Table holds. And a SuperHyperVertex-Decomposition are redefined to a "Neut- 1181  
rosophic SuperHyperVertex-Decomposition" if the intended Table holds. It's useful to define 1182  
"Neutrosophic" version of SuperHyperClasses. Since there's more ways to get Neutrosophic 1183  
type-results to make a Neutrosophic SuperHyperVertex-Decomposition more understandable. 1184  
Assume a Neutrosophic SuperHyperGraph. There are some Neutrosophic SuperHyperClasses 1185  
if the intended Table holds. Thus SuperHyperPath, SuperHyperVertex-Decomposition, 1186  
SuperHyperStar, SuperHyperBipartite, SuperHyperMultiPartite, and SuperHyperWheel, 1187  
are "Neutrosophic SuperHyperPath", "Neutrosophic SuperHyperVertex-Decomposition", 1188  
"Neutrosophic SuperHyperStar", "Neutrosophic SuperHyperBipartite", "Neutrosophic Super- 1189  
HyperMultiPartite", and "Neutrosophic SuperHyperWheel" if the intended Table holds. A 1190  
SuperHyperGraph has a "Neutrosophic SuperHyperVertex-Decomposition" where it's the 1191  
strongest [the maximum Neutrosophic value from all the SuperHyperVertex-Decomposition 1192  
amid the maximum value amid all SuperHyperVertices from a SuperHyperVertex-Decomposition 1193  
.] SuperHyperVertex-Decomposition . A graph is a SuperHyperUniform if it's a SuperHyper- 1194  
Graph and the number of elements of SuperHyperEdges are the same. Assume a Neutrosophic 1195  
SuperHyperGraph. There are some SuperHyperClasses as follows. It's SuperHyperPath if it's 1196  
only one SuperVertex as intersection amid two given SuperHyperEdges with two exceptions; 1197  
it's SuperHyperVertex-Decomposition if it's only one SuperVertex as intersection amid two 1198  
given SuperHyperEdges; it's SuperHyperStar it's only one SuperVertex as intersection amid 1199



all SuperHyperEdges; it's SuperHyperBipartite it's only one SuperVertex as intersection  
 amid two given SuperHyperEdges and these SuperVertices, forming two separate sets, has  
 no SuperHyperEdge in common; it's SuperHyperMultiPartite it's only one SuperVertex as  
 intersection amid two given SuperHyperEdges and these SuperVertices, forming multi separate  
 sets, has no SuperHyperEdge in common; it's a SuperHyperWheel if it's only one SuperVertex  
 as intersection amid two given SuperHyperEdges and one SuperVertex has one SuperHyperEdge  
 with any common SuperVertex. The SuperHyperModel proposes the specific designs and  
 the specific architectures. The SuperHyperModel is officially called "SuperHyperGraph" and  
 "Neutrosophic SuperHyperGraph". In this SuperHyperModel, The "specific" cells and "specific  
 group" of cells are SuperHyperModeled as "SuperHyperVertices" and the common and intended  
 properties between "specific" cells and "specific group" of cells are SuperHyperModeled as  
 "SuperHyperEdges". Sometimes, it's useful to have some degrees of determinacy, indeterminacy,  
 and neutrality to have more precise SuperHyperModel which in this case the SuperHyperModel  
 is called "Neutrosophic". In the future research, the foundation will be based on the "Cancer's  
 Recognition" and the results and the definitions will be introduced in redeemed ways. The  
 recognition of the cancer in the long-term function. The specific region has been assigned  
 by the model [it's called SuperHyperGraph] and the long cycle of the move from the cancer  
 is identified by this research. Sometimes the move of the cancer hasn't be easily identified  
 since there are some determinacy, indeterminacy and neutrality about the moves and the  
 effects of the cancer on that region; this event leads us to choose another model [it's said  
 to be Neutrosophic SuperHyperGraph] to have convenient perception on what's happened  
 and what's done. There are some specific models, which are well-known and they've got the  
 names, and some SuperHyperGeneral SuperHyperModels. The moves and the traces of the  
 cancer on the complex tracks and between complicated groups of cells could be fantasized by a  
 Neutrosophic SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, Super-  
 HyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the  
 longest SuperHyperVertex-Decomposition or the strongest SuperHyperVertex-Decomposition  
 in those Neutrosophic SuperHyperModels. For the longest SuperHyperVertex-Decomposition,  
 called SuperHyperVertex-Decomposition, and the strongest SuperHyperVertex-Decomposition,  
 called Neutrosophic SuperHyperVertex-Decomposition, some general results are introduced.  
 Beyond that in SuperHyperStar, all possible SuperHyperPaths have only two SuperHyperEdges  
 but it's not enough since it's essential to have at least three SuperHyperEdges to form any style  
 of a SuperHyperVertex-Decomposition. There isn't any formation of any SuperHyperVertex-  
 Decomposition but literarily, it's the deformation of any SuperHyperVertex-Decomposition. It,  
 literarily, deforms and it doesn't form. A basic familiarity with Neutrosophic SuperHyperVertex-  
 Decomposition theory, SuperHyperGraphs, and Neutrosophic SuperHyperGraphs theory are  
 proposed.

**Keywords:** Neutrosophic SuperHyperGraph, SuperHyperVertex-Decomposition, Cancer's

Neutrosophic Recognition

**AMS Subject Classification:** 05C17, 05C22, 05E45



## CHAPTER 8

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# Applied Notions Under The Scrutiny Of The Motivation Of This Scientific Research

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In this scientific research, there are some ideas in the featured frameworks of motivations. I try to bring the motivations in the narrative ways. Some cells have been faced with some attacks from the situation which is caused by the cancer's attacks. In this case, there are some embedded analysis on the ongoing situations which in that, the cells could be labelled as some groups and some groups or individuals have excessive labels which all are raised from the behaviors to overcome the cancer's attacks. In the embedded situations, the individuals of cells and the groups of cells could be considered as "new groups". Thus it motivates us to find the proper SuperHyperModels for getting more proper analysis on this messy story. I've found the SuperHyperModels which are officially called "SuperHyperGraphs" and "Extreme SuperHyperGraphs". In this SuperHyperModel, the cells and the groups of cells are defined as "SuperHyperVertices" and the relations between the individuals of cells and the groups of cells are defined as "SuperHyperEdges". Thus it's another motivation for us to do research on this SuperHyperModel based on the "Cancer's Recognition". Sometimes, the situations get worst. The situation is passed from the certainty and precise style. Thus it's the beyond them. There are three descriptions, namely, the degrees of determinacy, indeterminacy and neutrality, for any object based on vague forms, namely, incomplete data, imprecise data, and uncertain analysis. The latter model could be considered on the previous SuperHyperModel. It's SuperHyperModel. It's SuperHyperGraph but it's officially called "Extreme SuperHyperGraphs". The cancer is the disease but the model is going to figure out what's going on this phenomenon. The special case of this disease is considered and as the consequences of the model, some parameters are used. The cells are under attack of this disease but the moves of the cancer in the special region are the matter of mind. The recognition of the cancer could help to find some treatments for this disease. The SuperHyperGraph and Extreme SuperHyperGraph are the SuperHyperModels on the "Cancer's Recognition" and both bases are the background of this research. Sometimes the cancer has been happened on the region, full of cells, groups of cells and embedded styles. In this segment, the SuperHyperModel proposes some SuperHyperNotions based on the connectivities of the moves of the cancer in the forms of alliances' styles with the formation of the design and the architecture are formally called " SuperHyperVertex-Decomposition" in the themes of jargons and buzzwords. The prefix "SuperHyper" refers to the theme of the embedded

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styles to figure out the background for the SuperHyperNotions. The recognition of the cancer 1273  
in the long-term function. The specific region has been assigned by the model [it's called 1274  
SuperHyperGraph] and the long cycle of the move from the cancer is identified by this research. 1275  
Sometimes the move of the cancer hasn't be easily identified since there are some determinacy, 1276  
indeterminacy and neutrality about the moves and the effects of the cancer on that region; 1277  
this event leads us to choose another model [it's said to be Extreme SuperHyperGraph] to 1278  
have convenient perception on what's happened and what's done. There are some specific 1279  
models, which are well-known and they've got the names, and some general models. The 1280  
moves and the traces of the cancer on the complex tracks and between complicated groups of 1281  
cells could be fantasized by an Extreme SuperHyperPath (-/SuperHyperVertex-Decomposition, 1282  
SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is 1283  
to find either the optimal SuperHyperVertex-Decomposition or the Extreme SuperHyperVertex- 1284  
Decomposition in those Extreme SuperHyperModels. Some general results are introduced. 1285  
Beyond that in SuperHyperStar, all possible Extreme SuperHyperPath s have only two 1286  
SuperHyperEdges but it's not enough since it's essential to have at least three SuperHyperEdges 1287  
to form any style of a SuperHyperVertex-Decomposition. There isn't any formation of any 1288  
SuperHyperVertex-Decomposition but literarily, it's the deformation of any SuperHyperVertex- 1289  
Decomposition. It, literarily, deforms and it doesn't form. 1290

**Question 8.0.1.** *How to define the SuperHyperNotions and to do research on them to find the “ 1291  
amount of SuperHyperVertex-Decomposition” of either individual of cells or the groups of cells 1292  
based on the fixed cell or the fixed group of cells, extensively, the “amount of SuperHyperVertex- 1293  
Decomposition” based on the fixed groups of cells or the fixed groups of group of cells? 1294*

**Question 8.0.2.** *What are the best descriptions for the “Cancer's Recognition” in terms of these 1295  
messy and dense SuperHyperModels where embedded notions are illustrated? 1296*

It's motivation to find notions to use in this dense model is titled “SuperHyperGraphs”. Thus 1297  
it motivates us to define different types of “ SuperHyperVertex-Decomposition” and “Extreme 1298  
SuperHyperVertex-Decomposition” on “SuperHyperGraph” and “Extreme SuperHyperGraph”. 1299  
Then the research has taken more motivations to define SuperHyperClasses and to find some 1300  
connections amid this SuperHyperNotion with other SuperHyperNotions. It motivates us to get 1301  
some instances and examples to make clarifications about the framework of this research. The 1302  
general results and some results about some connections are some avenues to make key point of 1303  
this research, “Cancer's Recognition”, more understandable and more clear. 1304  
The framework of this research is as follows. In the beginning, I introduce basic definitions 1305  
to clarify about preliminaries. In the subsection “Preliminaries”, initial definitions about 1306  
SuperHyperGraphs and Extreme SuperHyperGraph are deeply-introduced and in-depth- 1307  
discussed. The elementary concepts are clarified and illustrated completely and sometimes 1308  
review literature are applied to make sense about what's going to figure out about the upcoming 1309  
sections. The main definitions and their clarifications alongside some results about new 1310  
notions, SuperHyperVertex-Decomposition and Extreme SuperHyperVertex-Decomposition, are 1311  
figured out in sections “ SuperHyperVertex-Decomposition” and “Extreme SuperHyperVertex- 1312  
Decomposition”. In the sense of tackling on getting results and in Vertex-Decomposition to 1313  
make sense about continuing the research, the ideas of SuperHyperUniform and Extreme 1314  
SuperHyperUniform are introduced and as their consequences, corresponded SuperHyperClasses 1315  
are figured out to debut what's done in this section, titled “Results on SuperHyperClasses” 1316  
and “Results on Extreme SuperHyperClasses”. As going back to origin of the notions, 1317

there are some smart steps toward the common notions to extend the new notions in new 1318  
frameworks, SuperHyperGraph and Extreme SuperHyperGraph, in the sections “Results on 1319  
SuperHyperClasses” and “Results on Extreme SuperHyperClasses”. The starter research about 1320  
the general SuperHyperRelations and as concluding and closing section of theoretical research are 1321  
contained in the section “General Results”. Some general SuperHyperRelations are fundamental 1322  
and they are well-known as fundamental SuperHyperNotions as elicited and discussed in the 1323  
sections, “General Results”, “ SuperHyperVertex-Decomposition”, “Extreme SuperHyperVertex- 1324  
Decomposition”, “Results on SuperHyperClasses” and “Results on Extreme SuperHyperClasses”. 1325  
There are curious questions about what’s done about the SuperHyperNotions to make sense 1326  
about excellency of this research and going to figure out the word “best” as the description 1327  
and adjective for this research as presented in section, “ SuperHyperVertex-Decomposition”. 1328  
The keyword of this research debut in the section “Applications in Cancer’s Recognition” 1329  
with two cases and subsections “Case 1: The Initial Steps Toward SuperHyperBipartite as 1330  
SuperHyperModel” and “Case 2: The Increasing Steps Toward SuperHyperMultipartite as 1331  
SuperHyperModel”. In the section, “Open Problems”, there are some scrutiny and discernment 1332  
on what’s done and what’s happened in this research in the terms of “questions” and “problems” 1333  
to make sense to figure out this research in featured style. The advantages and the limitations 1334  
of this research alongside about what’s done in this research to make sense and to get sense 1335  
about what’s figured out are included in the section, “Conclusion and Closing Remarks”. 1336





# Extreme Preliminaries Of This Scientific Research On the Redeemed Ways

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In this section, the basic material in this scientific research, is referred to [Single Valued Neutrosophic Set](Ref.[HG38],Definition 2.2,p.2), [Neutrosophic Set](Ref.[HG38],Definition 2.1,p.1), [Neutrosophic SuperHyperGraph (NSHG)](Ref.[HG38],Definition 2.5,p.2), [Characterization of the Neutrosophic SuperHyperGraph (NSHG)](Ref.[HG38],Definition 2.7,p.3), [t-norm](Ref.[HG38], Definition 2.7, p.3), and [Characterization of the Neutrosophic SuperHyperGraph (NSHG)](Ref.[HG38],Definition 2.7,p.3), [Neutrosophic Strength of the Neutrosophic SuperHyperPaths] (Ref.[HG38],Definition 5.3,p.7), and [Different Neutrosophic Types of Neutrosophic SuperHyperEdges (NSHE)] (Ref.[HG38],Definition 5.4,p.7). Also, the new ideas and their clarifications are addressed to Ref.[HG38].

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In this subsection, the basic material which is used in this scientific research, is presented. Also, the new ideas and their clarifications are elicited.

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**Definition 9.0.1** (Neutrosophic Set). (Ref.[HG38],Definition 2.1,p.1).

Let  $X$  be a Vertex-Decomposition of points (objects) with generic elements in  $X$  denoted by  $x$ ; then the **Neutrosophic set**  $A$  (NS  $A$ ) is an object having the form

$$A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}$$

where the functions  $T, I, F : X \rightarrow ]^{-}0, 1^{+}[$  define respectively the a **truth-membership function**, an **indeterminacy-membership function**, and a **falsity-membership function** of the element  $x \in X$  to the set  $A$  with the condition

$$^{-}0 \leq T_A(x) + I_A(x) + F_A(x) \leq 3^{+}.$$

The functions  $T_A(x), I_A(x)$  and  $F_A(x)$  are real standard or nonstandard subsets of  $]^{-}0, 1^{+}[$ .

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**Definition 9.0.2** (Single Valued Neutrosophic Set). (Ref.[HG38],Definition 2.2,p.2).

Let  $X$  be a Vertex-Decomposition of points (objects) with generic elements in  $X$  denoted by  $x$ . A **single valued Neutrosophic set**  $A$  (SVNS  $A$ ) is characterized by truth-membership function  $T_A(x)$ , an indeterminacy-membership function  $I_A(x)$ , and a falsity-membership function  $F_A(x)$ . For each point  $x$  in  $X$ ,  $T_A(x), I_A(x), F_A(x) \in [0, 1]$ . A SVNS  $A$  can be written as

$$A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}.$$

**Definition 9.0.3.** The **degree of truth-membership, indeterminacy-membership** and **falsity-membership of the subset**  $X \subset A$  of the single valued Neutrosophic set  $A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$ :

$$T_A(X) = \min[T_A(v_i), T_A(v_j)]_{v_i, v_j \in X},$$

$$I_A(X) = \min[I_A(v_i), I_A(v_j)]_{v_i, v_j \in X},$$

$$\text{and } F_A(X) = \min[F_A(v_i), F_A(v_j)]_{v_i, v_j \in X}.$$

**Definition 9.0.4.** The **support** of  $X \subset A$  of the single valued Neutrosophic set  $A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$ :

$$\text{supp}(X) = \{x \in X : T_A(x), I_A(x), F_A(x) > 0\}.$$

**Definition 9.0.5** (Neutrosophic SuperHyperGraph (NSHG)). (**Ref.**[HG38], Definition 2.5, p.2). 1352  
Assume  $V'$  is a given set. a **Neutrosophic SuperHyperGraph** (NSHG)  $S$  is a pair  $S = (V, E)$ , 1353  
where 1354

- (i)  $V = \{V_1, V_2, \dots, V_n\}$  a finite set of finite single valued Neutrosophic subsets of  $V'$ ; 1355
- (ii)  $V = \{(V_i, T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i)) : T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i) \geq 0\}$ ,  $(i = 1, 2, \dots, n)$ ; 1356
- (iii)  $E = \{E_1, E_2, \dots, E_{n'}\}$  a finite set of finite single valued Neutrosophic subsets of  $V$ ; 1357
- (iv)  $E = \{(E_{i'}, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'})) : T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}) \geq 0\}$ ,  $(i' = 1, 2, \dots, n')$ ; 1358  
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- (v)  $V_i \neq \emptyset$ ,  $(i = 1, 2, \dots, n)$ ; 1360
- (vi)  $E_{i'} \neq \emptyset$ ,  $(i' = 1, 2, \dots, n')$ ; 1361
- (vii)  $\sum_i \text{supp}(V_i) = V$ ,  $(i = 1, 2, \dots, n)$ ; 1362
- (viii)  $\sum_{i'} \text{supp}(E_{i'}) = V$ ,  $(i' = 1, 2, \dots, n')$ ; 1363
- (ix) and the following conditions hold:

$$T'_V(E_{i'}) \leq \min[T_{V'}(V_i), T_{V'}(V_j)]_{V_i, V_j \in E_{i'}},$$

$$I'_V(E_{i'}) \leq \min[I_{V'}(V_i), I_{V'}(V_j)]_{V_i, V_j \in E_{i'}},$$

$$\text{and } F'_V(E_{i'}) \leq \min[F_{V'}(V_i), F_{V'}(V_j)]_{V_i, V_j \in E_{i'}}$$

where  $i' = 1, 2, \dots, n'$ . 1364

Here the Neutrosophic SuperHyperEdges (NSHE)  $E_{j'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_j$  are single valued Neutrosophic sets.  $T_{V'}(V_i)$ ,  $I_{V'}(V_i)$ , and  $F_{V'}(V_i)$  denote the 1365  
degree of truth-membership, the degree of indeterminacy-membership and the degree of 1366  
falsity-membership the Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to the Neutrosophic 1367  
SuperHyperVertex (NSHV)  $V$ .  $T'_V(E_{i'})$ ,  $I'_V(E_{i'})$ , and  $F'_V(E_{i'})$  denote the degree of truth- 1368  
membership, the degree of indeterminacy-membership and the degree of falsity-membership of 1369  
the Neutrosophic SuperHyperEdge (NSHE)  $E_{i'}$  to the Neutrosophic SuperHyperEdge (NSHE) 1370  
 $E$ . Thus, the  $ii'$ th element of the **incidence matrix** of Neutrosophic SuperHyperGraph (NSHG) 1371  
are of the form  $(V_i, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}))$ , the sets  $V$  and  $E$  are crisp sets. 1372  
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**Definition 9.0.6** (Characterization of the Neutrosophic SuperHyperGraph (NSHG)). (Ref.[HG38], Definition 2.7, p.3).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . The Neutrosophic SuperHyperEdges (NSHE)  $E_{i'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_i$  of Neutrosophic SuperHyperGraph (NSHG)  $S = (V, E)$  could be characterized as follow-up items.

- (i) If  $|V_i| = 1$ , then  $V_i$  is called **vertex**;
- (ii) if  $|V_i| \geq 1$ , then  $V_i$  is called **SuperVertex**;
- (iii) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **edge**;
- (iv) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **HyperEdge**;
- (v) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **SuperEdge**;
- (vi) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **SuperHyperEdge**.

If we choose different types of binary operations, then we could get hugely diverse types of general forms of Neutrosophic SuperHyperGraph (NSHG).

**Definition 9.0.7** (t-norm). (Ref.[HG38], Definition 2.7, p.3).

A binary operation  $\otimes : [0, 1] \times [0, 1] \rightarrow [0, 1]$  is a **t-norm** if it satisfies the following for  $x, y, z, w \in [0, 1]$ :

- (i)  $1 \otimes x = x$ ;
- (ii)  $x \otimes y = y \otimes x$ ;
- (iii)  $x \otimes (y \otimes z) = (x \otimes y) \otimes z$ ;
- (iv) If  $w \leq x$  and  $y \leq z$  then  $w \otimes y \leq x \otimes z$ .

**Definition 9.0.8.** The **degree of truth-membership, indeterminacy-membership and falsity-membership of the subset**  $X \subset A$  of the single valued Neutrosophic set  $A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}$  (with respect to t-norm  $T_{norm}$ ):

$$T_A(X) = T_{norm}[T_A(v_i), T_A(v_j)]_{v_i, v_j \in X},$$

$$I_A(X) = T_{norm}[I_A(v_i), I_A(v_j)]_{v_i, v_j \in X},$$

$$\text{and } F_A(X) = T_{norm}[F_A(v_i), F_A(v_j)]_{v_i, v_j \in X}.$$

**Definition 9.0.9.** The **support** of  $X \subset A$  of the single valued Neutrosophic set  $A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}$ :

$$\text{supp}(X) = \{ x \in X : T_A(x), I_A(x), F_A(x) > 0 \}.$$

**Definition 9.0.10.** (General Forms of Neutrosophic SuperHyperGraph (NSHG)).

Assume  $V'$  is a given set. a **Neutrosophic SuperHyperGraph** (NSHG)  $S$  is a pair  $S = (V, E)$ , where

- (i)  $V = \{V_1, V_2, \dots, V_n\}$  a finite set of finite single valued Neutrosophic subsets of  $V'$ ; 1399
- (ii)  $V = \{(V_i, T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i)) : T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i) \geq 0\}$ ,  $(i = 1, 2, \dots, n)$ ; 1400
- (iii)  $E = \{E_1, E_2, \dots, E_{n'}\}$  a finite set of finite single valued Neutrosophic subsets of  $V$ ; 1401
- (iv)  $E = \{(E_{i'}, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'})) : T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}) \geq 0\}$ ,  $(i' = 1, 2, \dots, n')$ ; 1402  
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- (v)  $V_i \neq \emptyset$ ,  $(i = 1, 2, \dots, n)$ ; 1404
- (vi)  $E_{i'} \neq \emptyset$ ,  $(i' = 1, 2, \dots, n')$ ; 1405
- (vii)  $\sum_i \text{supp}(V_i) = V$ ,  $(i = 1, 2, \dots, n)$ ; 1406
- (viii)  $\sum_{i'} \text{supp}(E_{i'}) = V$ ,  $(i' = 1, 2, \dots, n')$ . 1407

Here the Neutrosophic SuperHyperEdges (NSHE)  $E_{j'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_j$  are single valued Neutrosophic sets.  $T_{V'}(V_i)$ ,  $I_{V'}(V_i)$ , and  $F_{V'}(V_i)$  denote the degree of truth-membership, the degree of indeterminacy-membership and the degree of falsity-membership the Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to the Neutrosophic SuperHyperVertex (NSHV)  $V$ .  $T'_V(E_{i'})$ ,  $I'_V(E_{i'})$ , and  $F'_V(E_{i'})$  denote the degree of truth-membership, the degree of indeterminacy-membership and the degree of falsity-membership of the Neutrosophic SuperHyperEdge (NSHE)  $E_{i'}$  to the Neutrosophic SuperHyperEdge (NSHE)  $E$ . Thus, the  $ii'$ 'th element of the **incidence matrix** of Neutrosophic SuperHyperGraph (NSHG) are of the form  $(V_i, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}))$ , the sets  $V$  and  $E$  are crisp sets. 1408  
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**Definition 9.0.11** (Characterization of the Neutrosophic SuperHyperGraph (NSHG)). 1417  
(Ref.[HG38], Definition 2.7,p.3). 1418

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . The Neutrosophic SuperHyperEdges (NSHE)  $E_{i'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_i$  of Neutrosophic SuperHyperGraph (NSHG)  $S = (V, E)$  could be characterized as follow-up items. 1419  
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- (i) If  $|V_i| = 1$ , then  $V_i$  is called **vertex**; 1422
- (ii) if  $|V_i| \geq 1$ , then  $V_i$  is called **SuperVertex**; 1423
- (iii) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **edge**; 1424
- (iv) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **HyperEdge**; 1425
- (v) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **SuperEdge**; 1426  
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- (vi) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **SuperHyperEdge**. 1428  
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This SuperHyperModel is too messy and too dense. Thus there's a need to have some restrictions and conditions on SuperHyperGraph. The special case of this SuperHyperGraph makes the patterns and regularities. 1430  
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**Definition 9.0.12.** A graph is **SuperHyperUniform** if it's SuperHyperGraph and the number of elements of SuperHyperEdges are the same. 1433  
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To get more visions on SuperHyperUniform, the some SuperHyperClasses are introduced. It makes to have SuperHyperUniform more understandable.

**Definition 9.0.13.** Assume a Neutrosophic SuperHyperGraph. There are some SuperHyperClasses as follows.

- (i). It's **Neutrosophic SuperHyperPath** if it's only one SuperVertex as intersection amid two given SuperHyperEdges with two exceptions;
- (ii). it's **SuperHyperCycle** if it's only one SuperVertex as intersection amid two given SuperHyperEdges;
- (iii). it's **SuperHyperStar** it's only one SuperVertex as intersection amid all SuperHyperEdges;
- (iv). it's **SuperHyperBipartite** it's only one SuperVertex as intersection amid two given SuperHyperEdges and these SuperVertices, forming two separate sets, has no SuperHyperEdge in common;
- (v). it's **SuperHyperMultiPartite** it's only one SuperVertex as intersection amid two given SuperHyperEdges and these SuperVertices, forming multi separate sets, has no SuperHyperEdge in common;
- (vi). it's **SuperHyperWheel** if it's only one SuperVertex as intersection amid two given SuperHyperEdges and one SuperVertex has one SuperHyperEdge with any common SuperVertex.

**Definition 9.0.14.** Let a pair  $S = (V, E)$  be a Neutrosophic SuperHyperGraph (NSHG)  $S$ . Then a sequence of Neutrosophic SuperHyperVertices (NSHV) and Neutrosophic SuperHyperEdges (NSHE)

$$V_1, E_1, V_2, E_2, V_3, \dots, V_{s-1}, E_{s-1}, V_s$$

is called a **Neutrosophic SuperHyperPath** (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_1$  to Neutrosophic SuperHyperVertex (NSHV)  $V_s$  if either of following conditions hold:

- (i)  $V_i, V_{i+1} \in E_{i'}$ ;
- (ii) there's a vertex  $v_i \in V_i$  such that  $v_i, V_{i+1} \in E_{i'}$ ;
- (iii) there's a SuperVertex  $V'_i \in V_i$  such that  $V'_i, V_{i+1} \in E_{i'}$ ;
- (iv) there's a vertex  $v_{i+1} \in V_{i+1}$  such that  $V_i, v_{i+1} \in E_{i'}$ ;
- (v) there's a SuperVertex  $V'_{i+1} \in V_{i+1}$  such that  $V_i, V'_{i+1} \in E_{i'}$ ;
- (vi) there are a vertex  $v_i \in V_i$  and a vertex  $v_{i+1} \in V_{i+1}$  such that  $v_i, v_{i+1} \in E_{i'}$ ;
- (vii) there are a vertex  $v_i \in V_i$  and a SuperVertex  $V'_{i+1} \in V_{i+1}$  such that  $v_i, V'_{i+1} \in E_{i'}$ ;
- (viii) there are a SuperVertex  $V'_i \in V_i$  and a vertex  $v_{i+1} \in V_{i+1}$  such that  $V'_i, v_{i+1} \in E_{i'}$ ;
- (ix) there are a SuperVertex  $V'_i \in V_i$  and a SuperVertex  $V'_{i+1} \in V_{i+1}$  such that  $V'_i, V'_{i+1} \in E_{i'}$ .

**Definition 9.0.15.** (Characterization of the Neutrosophic SuperHyperPaths).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . a Neutrosophic SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_1$  to Neutrosophic SuperHyperVertex (NSHV)  $V_s$  is sequence of Neutrosophic SuperHyperVertices (NSHV) and Neutrosophic SuperHyperEdges (NSHE)

$$V_1, E_1, V_2, E_2, V_3, \dots, V_{s-1}, E_{s-1}, V_s,$$

could be characterized as follow-up items.

- (i) If for all  $V_i, E_{j'}, |V_i| = 1, |E_{j'}| = 2$ , then NSHP is called **path**;
- (ii) if for all  $E_{j'}, |E_{j'}| = 2$ , and there's  $V_i, |V_i| \geq 1$ , then NSHP is called **SuperPath**;
- (iii) if for all  $V_i, E_{j'}, |V_i| = 1, |E_{j'}| \geq 2$ , then NSHP is called **HyperPath**;
- (iv) if there are  $V_i, E_{j'}, |V_i| \geq 1, |E_{j'}| \geq 2$ , then NSHP is called **Neutrosophic SuperHyperPath**.

**Definition 9.0.16** (Neutrosophic Strength of the Neutrosophic SuperHyperPaths). (Ref.[HG38], Definition 5.3,p.7).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . A Neutrosophic SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_1$  to Neutrosophic SuperHyperVertex (NSHV)  $V_s$  is sequence of Neutrosophic SuperHyperVertices (NSHV) and Neutrosophic SuperHyperEdges (NSHE)

$$V_1, E_1, V_2, E_2, V_3, \dots, V_{s-1}, E_{s-1}, V_s,$$

have

- (i) **Neutrosophic t-strength**  $(\min\{T(V_i)\}, m, n)_{i=1}^s$ ;
- (ii) **Neutrosophic i-strength**  $(m, \min\{I(V_i)\}, n)_{i=1}^s$ ;
- (iii) **Neutrosophic f-strength**  $(m, n, \min\{F(V_i)\})_{i=1}^s$ ;
- (iv) **Neutrosophic strength**  $(\min\{T(V_i)\}, \min\{I(V_i)\}, \min\{F(V_i)\})_{i=1}^s$ .

**Definition 9.0.17** (Different Neutrosophic Types of Neutrosophic SuperHyperEdges (NSHE)). (Ref.[HG38], Definition 5.4,p.7).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called

- (ix) **Neutrosophic t-connective** if  $T(E) \geq$  maximum number of Neutrosophic t-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ ;
- (x) **Neutrosophic i-connective** if  $I(E) \geq$  maximum number of Neutrosophic i-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ ;



(xi) **Neutrosophic f-connective** if  $F(E) \geq$  maximum number of Neutrosophic f-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ ;

(xii) **Neutrosophic connective** if  $(T(E), I(E), F(E)) \geq$  maximum number of Neutrosophic strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ .

**Definition 9.0.18.** (Different Neutrosophic Types of Neutrosophic SuperHyperVertex-Decomposition).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called

(i) **Neutrosophic e-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic e-SuperHyperVertex-Decomposition criteria** holds

$$\forall E' : E' \text{ is disconnect-able};$$

(ii) **Neutrosophic re-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic re-SuperHyperVertex-Decomposition criteria** holds

$$\forall E' : E' \text{ is disconnect-able};$$

$$\text{and } |E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}};$$

(iii) **Neutrosophic v-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic v-SuperHyperVertex-Decomposition criteria** holds

$$\forall V' : V' \text{ is disconnect-able};$$

(iv) **Neutrosophic rv-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic v-SuperHyperVertex-Decomposition criteria** holds

$$\forall V' : V' \text{ is disconnect-able};$$

$$\text{and } |V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}};$$

(v) **Neutrosophic SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition.

**Definition 9.0.19.** ((Neutrosophic) SuperHyperVertex-Decomposition).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called

- (i) an **Extreme SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; 1513-1520
- (ii) a **Neutrosophic SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; 1521-1528
- (iii) an **Extreme SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; and the Extreme power is corresponded to its Extreme coefficient; 1529-1538
- (iv) a **Neutrosophic SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic power is corresponded to its Neutrosophic coefficient; 1539-1549
- (v) an **Extreme V-SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive 1550-1555

Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; 1556  
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(vi) a **Neutrosophic V-SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; 1558  
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(vii) an **Extreme V-SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; and the Extreme power is corresponded to its Extreme coefficient; 1566  
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(viii) a **Neutrosophic SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic power is corresponded to its Neutrosophic coefficient. 1576  
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**Definition 9.0.20.** ((Extreme/Neutrosophic) $\delta$ -SuperHyperVertex-Decomposition). 1587  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Then 1588

(i) an  $\delta$ -**SuperHyperVertex-Decomposition** is a Neutrosophic kind of Neutrosophic SuperHyperVertex-Decomposition such that either of the following expressions hold for the Neutrosophic cardinalities of SuperHyperNeighbors of  $s \in S$  : 1589  
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$$\begin{aligned} |S \cap N(s)| &> |S \cap (V \setminus N(s))| + \delta; & \boxed{136EQN1} \\ |S \cap N(s)| &< |S \cap (V \setminus N(s))| + \delta. & \boxed{136EQN2} \end{aligned}$$

The Expression (29.1), holds if  $S$  is an  $\delta$ -**SuperHyperOffensive**. And the Expression (29.1), holds if  $S$  is an  $\delta$ -**SuperHyperDefensive**; 1592  
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Table 9.1: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph Mentioned in the Definition (29.0.23)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

136TBL3

- (ii) a **Neutrosophic  $\delta$ -SuperHyperVertex-Decomposition** is a Neutrosophic kind of Neutrosophic SuperHyperVertex-Decomposition such that either of the following Neutrosophic expressions hold for the Neutrosophic cardinalities of SuperHyperNeighbors of  $s \in S$  :

$$|S \cap N(s)|_{Neutrosophic} > |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta; \quad 136EQN3$$

$$|S \cap N(s)|_{Neutrosophic} < |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta. \quad 136EQN4$$

The Expression (29.1), holds if  $S$  is a **Neutrosophic  $\delta$ -SuperHyperOffensive**. And the Expression (29.1), holds if  $S$  is a **Neutrosophic  $\delta$ -SuperHyperDefensive**.

For the sake of having a Neutrosophic SuperHyperVertex-Decomposition, there's a need to “redefine” the notion of “Neutrosophic SuperHyperGraph”. The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of the position of labels to assign to the values.

136DEF1

**Definition 9.0.21.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . It's redefined **Neutrosophic SuperHyperGraph** if the Table (29.1) holds.

It's useful to define a “Neutrosophic” version of SuperHyperClasses. Since there's more ways to get Neutrosophic type-results to make a Neutrosophic more understandable.

136DEF2

**Definition 9.0.22.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . There are some **Neutrosophic SuperHyperClasses** if the Table (29.2) holds. Thus Neutrosophic SuperHyperPath, SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultiPartite, and SuperHyperWheel, are **Neutrosophic SuperHyperPath, Neutrosophic SuperHyperCycle, Neutrosophic SuperHyperStar, Neutrosophic SuperHyperBipartite, Neutrosophic SuperHyperMultiPartite, and Neutrosophic SuperHyperWheel** if the Table (29.2) holds.

It's useful to define a “Neutrosophic” version of a Neutrosophic SuperHyperVertex-Decomposition. Since there's more ways to get type-results to make a Neutrosophic SuperHyperVertex-Decomposition more Neutrosophicly understandable.

For the sake of having a Neutrosophic SuperHyperVertex-Decomposition, there's a need to “redefine” the Neutrosophic notion of “Neutrosophic SuperHyperVertex-Decomposition”. The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of the position of labels to assign to the values.

Table 9.2: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph, Mentioned in the Definition (29.0.22)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

136TBL4

Table 9.3: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph Mentioned in the Definition (29.0.23)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

136TBL1

136DEF1

**Definition 9.0.23.** Assume a SuperHyperVertex-Decomposition. It's redefined a **Neutrosophic SuperHyperVertex-Decomposition** if the Table (29.3) holds. 1623  
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## CHAPTER 10

1625

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# Extreme SuperHyperVertex-Decomposition But As The Extensions Excerpt From Dense And Super Forms

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**Definition 10.0.1.** (Extreme event).

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Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Any Extreme  $k$ -subset of  $A$  of  $V$  is called **Extreme  $k$ -event** and if  $k = 2$ , then Extreme subset of  $A$  of  $V$  is called **Extreme event**. The following expression is called **Extreme probability** of  $A$ .

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$$E(A) = \sum_{a \in A} E(a). \quad (10.1)$$

**Definition 10.0.2.** (Extreme Independent).

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Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition.  $s$  Extreme  $k$ -events  $A_i$ ,  $i \in I$  is called **Extreme  $s$ -independent** if the following expression is called **Extreme  $s$ -independent criteria**

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$$E(\cap_{i \in I} A_i) = \prod_{i \in I} P(A_i).$$

And if  $s = 2$ , then Extreme  $k$ -events of  $A$  and  $B$  is called **Extreme independent**. The following expression is called **Extreme independent criteria**

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$$E(A \cap B) = P(A)P(B). \quad (10.2)$$

**Definition 10.0.3.** (Extreme Variable).

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Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Any  $k$ -function Vertex-Decomposition like  $E$  is called **Extreme  $k$ -Variable**. If  $k = 2$ , then any 2-function Vertex-Decomposition like  $E$  is called **Extreme Variable**.

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The notion of independent on Extreme Variable is likewise.

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**Definition 10.0.4.** (Extreme Expectation). 1647

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. an Extreme k-Variable  $E$  has a number is called **Extreme Expectation** if the following expression is called **Extreme Expectation criteria** 1648  
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$$Ex(E) = \sum_{\alpha \in V} E(\alpha)P(\alpha).$$

**Definition 10.0.5.** (Extreme Crossing). 1651

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. an Extreme number is called **Extreme Crossing** if the following expression is called **Extreme Crossing criteria** 1652  
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$$Cr(S) = \min\{\text{Number of Crossing in a Plane Embedding of } S\}.$$

**Lemma 10.0.6.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $m$  and  $n$  propose special Vertex-Decomposition. Then with  $m \geq 4n$ , 1655  
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*Proof.* Consider a planar embedding  $G$  of  $G$  with  $cr(G)$  crossings. Let  $S$  be an Extreme random k-subset of  $V$  obtained by choosing each SuperHyperVertex of  $G$  Extreme independently with probability Vertex-Decomposition  $p := 4n/m$ , and set  $H := G[S]$  and  $H := G[S]$ . Define random variables  $X, Y, Z$  on  $V$  as follows:  $X$  is the Extreme number of SuperHyperVertices,  $Y$  the Extreme number of SuperHyperEdges, and  $Z$  the Extreme number of crossings of  $H$ . The trivial bound noted above, when applied to  $H$ , yields the inequality  $Z \geq cr(H) \geq Y - 3X$ . By linearity of Extreme Expectation,

$$E(Z) \geq E(Y) - 3E(X).$$

Now  $E(X) = pn$ ,  $E(Y) = p^2m$  (each SuperHyperEdge having some SuperHyperEnds) and  $E(Z) = p^4cr(G)$  (each crossing being defined by some SuperHyperVertices). Hence

$$p^4cr(G) \geq p^2m - 3pn.$$

Dividing both sides by  $p^4$ , we have: 1658

$$cr(G) \geq \frac{pm - 3n}{p^3} = \frac{n}{(4n/m)^3} = \frac{1}{64}m^3n^2.$$

■ 1659

**Theorem 10.0.7.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $P$  be a SuperHyperSet of  $n$  points in the plane, and let  $l$  be the Extreme number of SuperHyperLines in the plane passing through at least  $k + 1$  of these points, where  $1 \leq k \leq 2\sqrt{2n}$ . Then  $l < 32n^2/k^3$ . 1660  
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*Proof.* Form an Extreme SuperHyperGraph  $G$  with SuperHyperVertex SuperHyperSet  $P$  whose SuperHyperEdge are the segments between conseNeighborive points on the SuperHyperLines which pass through at least  $k + 1$  points of  $P$ . This Extreme SuperHyperGraph has at least  $kl$  SuperHyperEdges and Extreme crossing at most  $l$  choose two. Thus either  $kl < 4n$ , in which case  $l < 4n/k \leq 32n^2/k^3$ , or  $l^2/2 > 1$  choose  $2 \geq cr(G) \geq (kl)^3/64n^2$  by the Extreme Crossing Lemma, and again  $l < 32n^2/k^3$ . 1664  
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**Theorem 10.0.8.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $P$  be a SuperHyperSet of  $n$  points in the plane, and let  $k$  be the number of pairs of points of  $P$  at unit SuperHyperDistance. Then  $k < 5n^{4/3}$ .

*Proof.* Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Draw a SuperHyperUnit SuperHyperCircle around each SuperHyperPoint of  $P$ . Let  $n_i$  be the Extreme number of these SuperHyperCircles passing through exactly  $i$  points of  $P$ . Then  $\sum i = 0^{n-1} n_i = n$  and  $k = \frac{1}{2} \sum i = 0^{n-1} i n_i$ . Now form an Extreme SuperHyperGraph  $H$  with SuperHyperVertex SuperHyperSet  $P$  whose SuperHyperEdges are the SuperHyperArcs between conseNeighborive SuperHyperPoints on the SuperHyperCircles that pass through at least three SuperHyperPoints of  $P$ . Then

$$e(H) = \sum_{i=3}^{n-1} i n_i = 2k - n_1 - 2n_2 \geq 2k - 2n.$$

Some SuperHyperPairs of SuperHyperVertices of  $H$  might be joined by some parallel SuperHyperEdges. Delete from  $H$  one of each SuperHyperPair of parallel SuperHyperEdges, so as to obtain a simple Extreme SuperHyperGraph  $G$  with  $e(G) \geq k - n$ . Now  $cr(G) \leq n(n-1)$  because  $G$  is formed from at most  $n$  SuperHyperCircles, and any two SuperHyperCircles cross at most twice. Thus either  $e(G) < 4n$ , in which case  $k < 5n < 5n^{4/3}$ , or  $n^2 > n(n-1) \geq cr(G) \geq (k-n)^3/64n^2$  by the Extreme Crossing Lemma, and  $k < 4n^{4/3} + n < 5n^{4/3}$ . ■

**Proposition 10.0.9.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X$  be a nonnegative Extreme Variable and  $t$  a positive real number. Then

$$P(X \geq t) \leq \frac{E(X)}{t}.$$

*Proof.*

$$\begin{aligned} E(X) &= \sum \{X(a)P(a) : a \in V\} \geq \sum \{X(a)P(a) : a \in V, X(a) \geq t\} \\ &\geq \sum \{tP(a) : a \in V, X(a) \geq t\} = t \sum \{P(a) : a \in V, X(a) \geq t\} \\ &= tP(X \geq t). \end{aligned}$$

Dividing the first and last members by  $t$  yields the asserted inequality. ■

**Corollary 10.0.10.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X_n$  be a nonnegative integer-valued variable in a probability Vertex-Decomposition  $(V_n, E_n)$ ,  $n \geq 1$ . If  $E(X_n) \rightarrow 0$  as  $n \rightarrow \infty$ , then  $P(X_n = 0) \rightarrow 1$  as  $n \rightarrow \infty$ .

*Proof.*

**Theorem 10.0.11.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. A special SuperHyperGraph in  $G_{n,p}$  almost surely has stability number at most  $\lceil 2p^{-1} \log n \rceil$ .

*Proof.* Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. A special SuperHyperGraph in  $\mathcal{G}_{n,p}$  is up. Let  $G \in \mathcal{G}_{n,p}$  and let  $S$  be a given SuperHyperSet of  $k + 1$  SuperHyperVertices of  $G$ , where  $k \in \mathbb{N}$ . The probability that  $S$  is a stable SuperHyperSet of  $G$  is  $(1 - p)^{\binom{k+1}{2}}$ , this being the probability that none of the  $\binom{k+1}{2}$  pairs of SuperHyperVertices of  $S$  is a SuperHyperEdge of the Extreme SuperHyperGraph  $G$ . Let  $A_S$  denote the event that  $S$  is a stable SuperHyperSet of  $G$ , and let  $X_S$  denote the indicator Extreme Variable for this Extreme Event. By equation, we have

$$E(X_S) = P(X_S = 1) = P(A_S) = (1 - p)^{\binom{k+1}{2}}.$$

Let  $X$  be the number of stable SuperHyperSets of cardinality  $k + 1$  in  $G$ . Then

$$X = \sum \{X_S : S \subseteq V, |S| = k + 1\}$$

and so, by those,

$$E(X) = \sum \{E(X_S) : S \subseteq V, |S| = k + 1\} = \binom{n}{k+1} (1 - p)^{\binom{k+1}{2}}.$$

We bound the right-hand side by invoking two elementary inequalities:

$$\binom{n}{k+1} \leq \frac{n^{k+1}}{(k+1)!} \text{ and } 1 - p \leq e^{-p}.$$

This yields the following upper bound on  $E(X)$ .

$$E(X) \leq \frac{n^{k+1} e^{-p} \binom{k+1}{2}}{(k+1)!} = \frac{ne^{-pk/2k+1}}{(k+1)!}$$

Suppose now that  $k = \lceil 2p^{-1} \log n \rceil$ . Then  $k \geq 2p^{-1} \log n$ , so  $ne^{-pk/2} \leq 1$ . Because  $k$  grows at least as fast as the logarithm of  $n$ , implies that  $E(X) \rightarrow 0$  as  $n \rightarrow \infty$ . Because  $X$  is integer-valued and nonnegative, we deduce from Corollary that  $P(X = 0) \rightarrow 1$  as  $n \rightarrow \infty$ . Consequently, an Extreme SuperHyperGraph in  $\mathcal{G}_{n,p}$  almost surely has stability number at most  $k$ . ■

**Definition 10.0.12.** (Extreme Variance).

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. an Extreme  $k$ -Variable  $E$  has a number is called **Extreme Variance** if the following expression is called **Extreme Variance criteria**

$$Vx(E) = Ex((X - Ex(X))^2).$$

**Theorem 10.0.13.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X$  be an Extreme Variable and let  $t$  be a positive real number. Then

$$E(|X - Ex(X)| \geq t) \leq \frac{V(X)}{t^2}.$$

*Proof.* Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X$  be an Extreme Variable and let  $t$  be a positive real number. Then

$$E(|X - Ex(X)| \geq t) = E((X - Ex(X))^2 \geq t^2) \leq \frac{Ex((X - Ex(X))^2)}{t^2} = \frac{V(X)}{t^2}.$$

■ 1725

**Corollary 10.0.14.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X_n$  be an Extreme Variable in a probability Vertex-Decomposition  $(V_n, E_n), n \geq 1$ . If  $Ex(X_n) \neq 0$  and  $V(X_n) \ll E^2(X_n)$ , then

$$E(X_n = 0) \rightarrow 0 \text{ as } n \rightarrow \infty$$

*Proof.* Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Set  $X := X_n$  and  $t := |Ex(X_n)|$  in Chebyshev's Inequality, and observe that  $E(X_n = 0) \leq E(|X_n - Ex(X_n)| \geq |Ex(X_n)|)$  because  $|X_n - Ex(X_n)| = |Ex(X_n)|$  when  $X_n = 0$ .

■ 1732

**Theorem 10.0.15.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $G \in \mathcal{G}_{n,1/2}$ . For  $0 \leq k \leq n$ , set  $f(k) := (n \text{ choose } k)2^{-(k \text{ choose } 2)}$  and let  $k^*$  be the least value of  $k$  for which  $f(k)$  is less than one. Then almost surely  $\alpha(G)$  takes one of the three values  $k^* - 2, k^* - 1, k^*$ .

*Proof.* Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. As in the proof of related Theorem, the result is straightforward.

■ 1739

**Corollary 10.0.16.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $G \in \mathcal{G}_{n,1/2}$  and let  $f$  and  $k^*$  be as defined in previous Theorem. Then either:

- (i).  $f(k^*) \ll 1$ , in which case almost surely  $\alpha(G)$  is equal to either  $k^* - 2$  or  $k^* - 1$ , or
- (ii).  $f(k^* - 1) \gg 1$ , in which case almost surely  $\alpha(G)$  is equal to either  $k^* - 1$  or  $k^*$ .

*Proof.* Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. The latter is straightforward.

■ 1746

**Definition 10.0.17.** (Extreme Threshold).

1747

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $P$  be a monotone property of SuperHyperGraphs (one which is preserved when SuperHyperEdges are added). Then a **Extreme Threshold** for  $P$  is a function  $f(n)$  such that:

1751

- (i). if  $p \ll f(n)$ , then  $G \in \mathcal{G}_{n,p}$  almost surely does not have  $P$ ,
- (ii). if  $p \gg f(n)$ , then  $G \in \mathcal{G}_{n,p}$  almost surely has  $P$ .

1752

1753

**Definition 10.0.18.** (Extreme Balanced). 1754

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is 1755  
a probability Vertex-Decomposition. Let  $F$  be a fixed Extreme SuperHyperGraph. Then 1756  
there is a threshold function for the property of containing a copy of  $F$  as an Extreme 1757  
SubSuperHyperGraph is called **Extreme Balanced**. 1758

**Theorem 10.0.19.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . 1759  
Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $F$  be a nonempty balanced 1760  
Extreme SubSuperHyperGraph with  $k$  SuperHyperVertices and  $l$  SuperHyperEdges. Then  $n^{-k/l}$  1761  
is a threshold function for the property of containing  $F$  as an Extreme SubSuperHyperGraph. 1762

*Proof.* Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider 1763  
 $S = (V, E)$  is a probability Vertex-Decomposition. The latter is straightforward. ■ 1764

136EXM1

**Example 10.0.20.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in 1765  
the mentioned Extreme Figures in every Extreme items. 1766

- On the Figure (30.1), the Extreme SuperHyperNotion, namely, Extreme 1767  
SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight- 1768  
forward.  $E_1$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_2$  is a loop Extreme 1769  
SuperHyperEdge and  $E_4$  is an Extreme SuperHyperEdge. Thus in the terms of Extreme 1770  
SuperHyperNeighbor, there's only one Extreme SuperHyperEdge, namely,  $E_4$ . The 1771  
Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that there's no Extreme 1772  
SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme SuperHyperVertex, 1773  
 $V_3$ , is excluded in every given Extreme SuperHyperVertex-Decomposition. 1774

$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} = z^0. \\ & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} = z^0. \end{aligned}$$

1775

- On the Figure (30.2), the Extreme SuperHyperNotion, namely, Extreme 1776  
SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight- 1777  
forward.  $E_1, E_2$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_4$  is an Extreme 1778  
SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's only 1779  
one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is 1780  
Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme 1781  
endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme 1782  
SuperHyperVertex-Decomposition. 1783

$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} = z^0. \end{aligned}$$

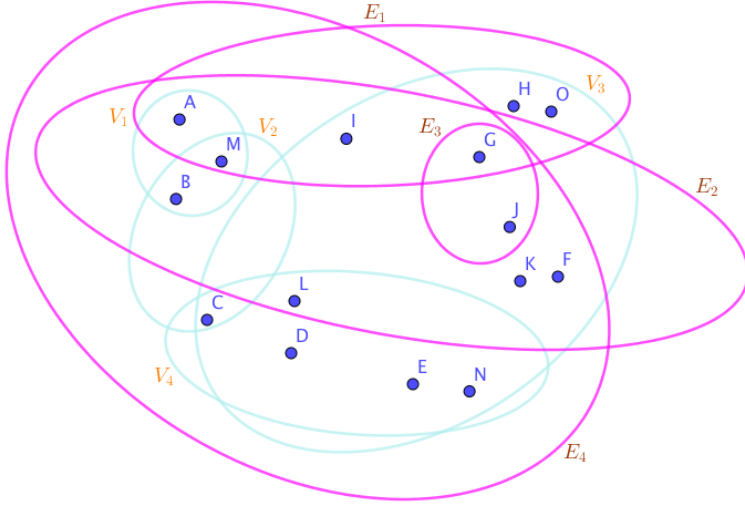


Figure 10.1: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG1

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} &= \{\{\}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} &= z^0. \end{aligned}$$

1784

- On the Figure (30.3), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward. 1785 1786 1787

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} &= \{\{\}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} &= z^0. \\ \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} &= \{\{\}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} &= z^0. \end{aligned}$$

1788

- On the Figure (30.4), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight- 1789 1790

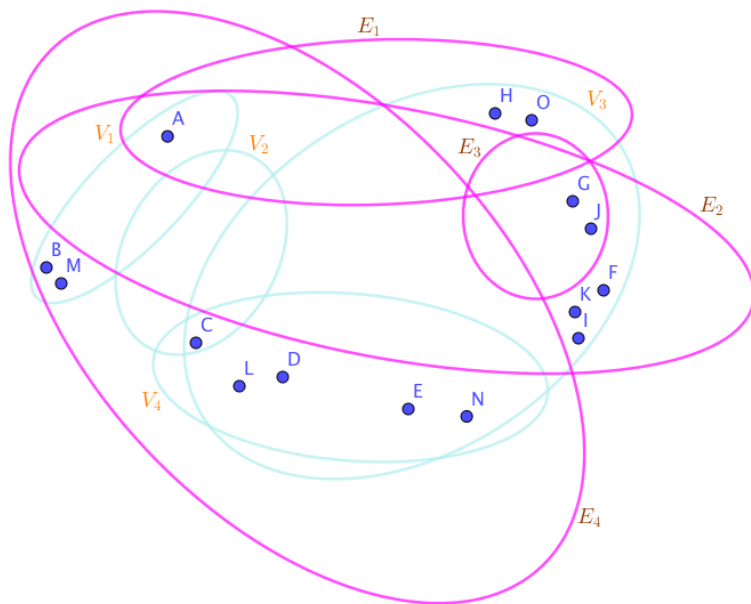


Figure 10.2: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG2

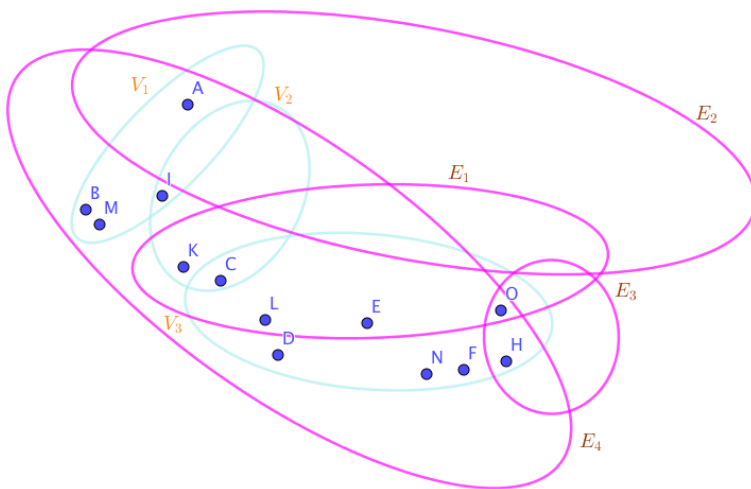


Figure 10.3: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG3



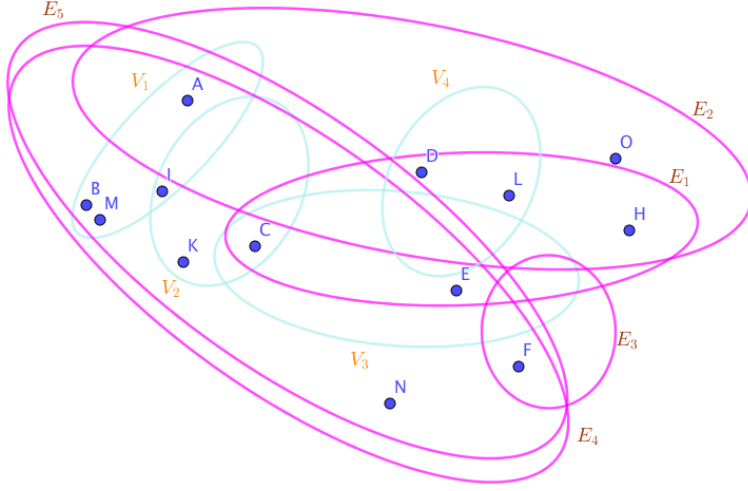


Figure 10.4: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG4

forward.

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^3 + z^0. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{V_3\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^2 + z^0.
 \end{aligned}$$

1792

- On the Figure (30.5), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward.

1793

1794

1795

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{V_5\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}}
 \end{aligned}$$

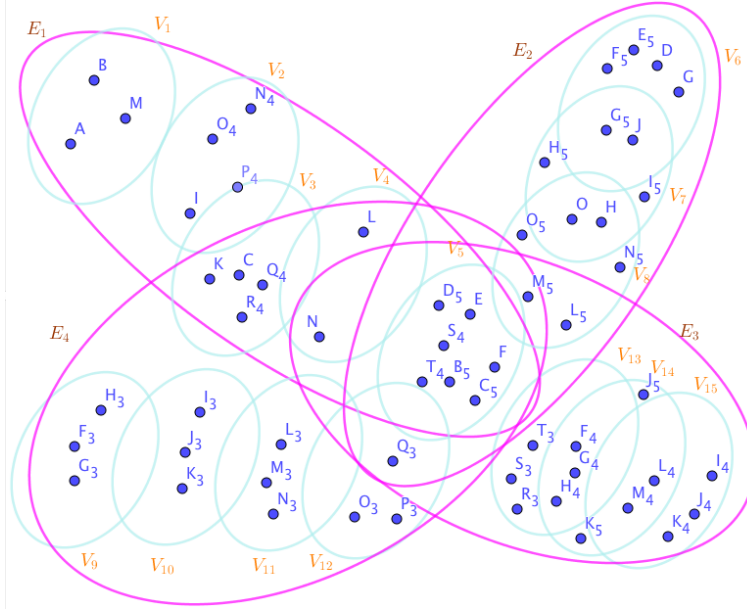


Figure 10.5: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG5

$$= z^7 + z^0.$$

1796

- On the Figure (30.6), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward. 1797  
1798  
1799

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

1800

- On the Figure (30.7), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward. 1801  
1802  
1803

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}}$$

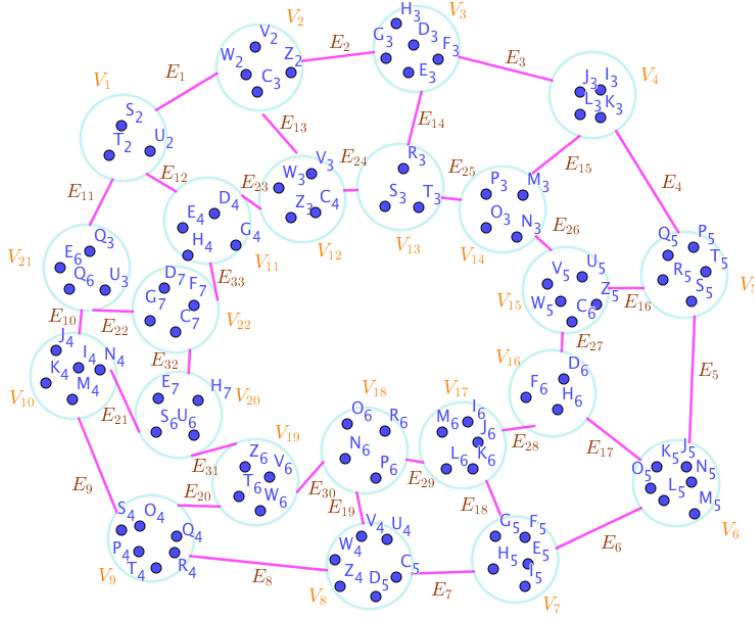


Figure 10.6: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG6

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

1804

- On the Figure (30.8), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward. 1805  
1806  
1807

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} =$$

$$\{\{E_4\}, \{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^3 + z^0.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}}$$

$$= \{\{V_{12}\}, \{V_{13}\}, \{V_{14}\}, \{\}\}.$$

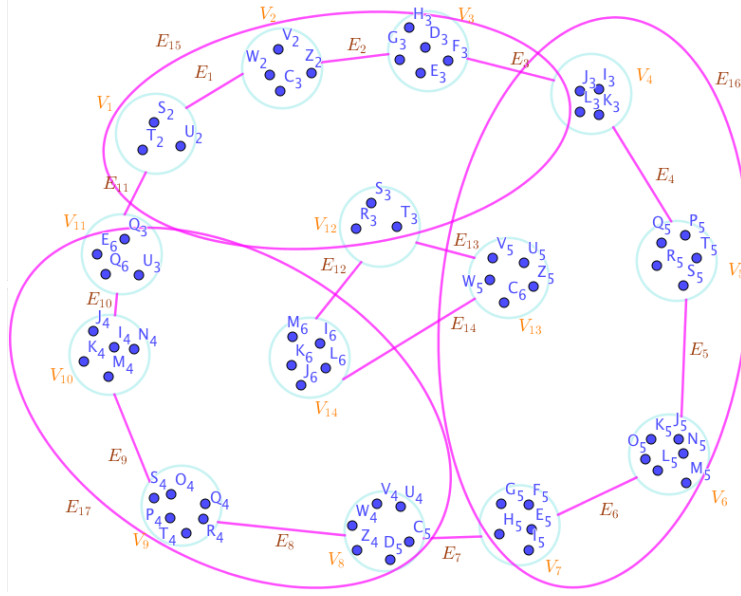


Figure 10.7: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG7

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= 2z^5 + z^3 + z^0. \end{aligned}$$

1808

- On the Figure (30.9), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward. 1809 1810 1811

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\ &= \{\{\}\}. \\ &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \\ &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\ &= \{\{\}\}. \\ &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

1812

- On the Figure (30.10), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight- 1813 1814

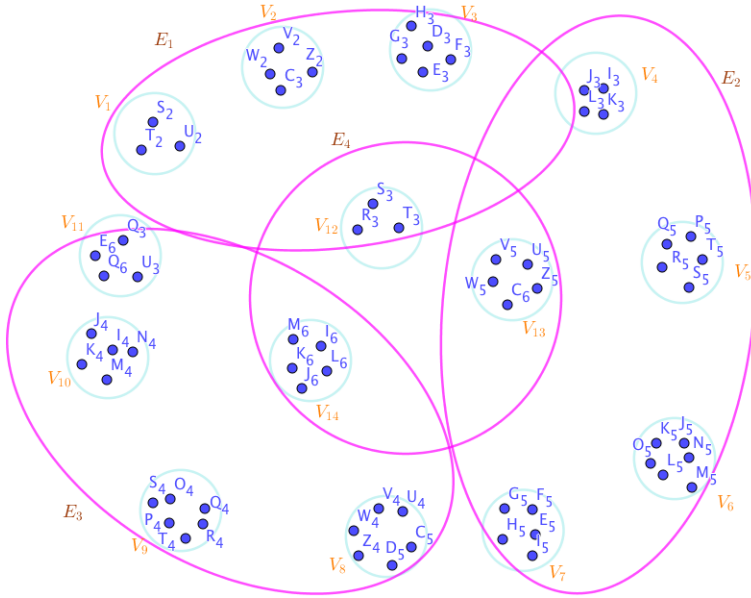


Figure 10.8: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG8

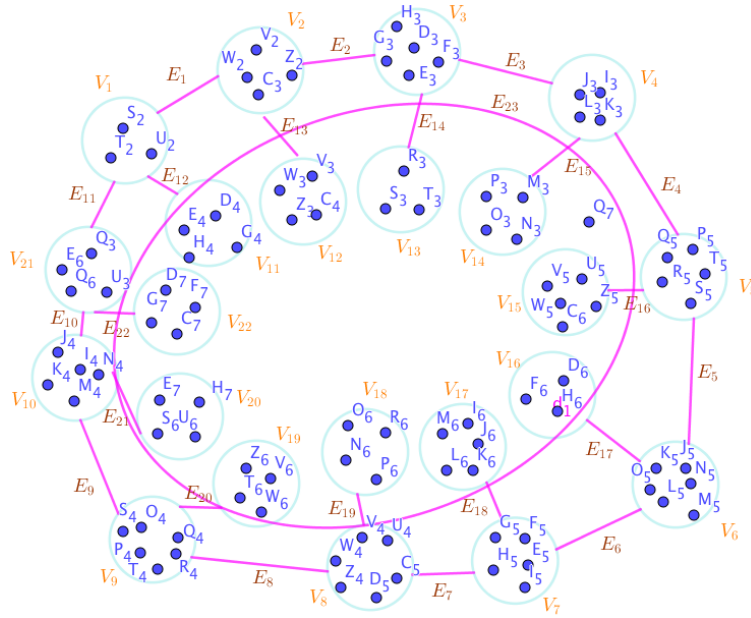


Figure 10.9: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG9

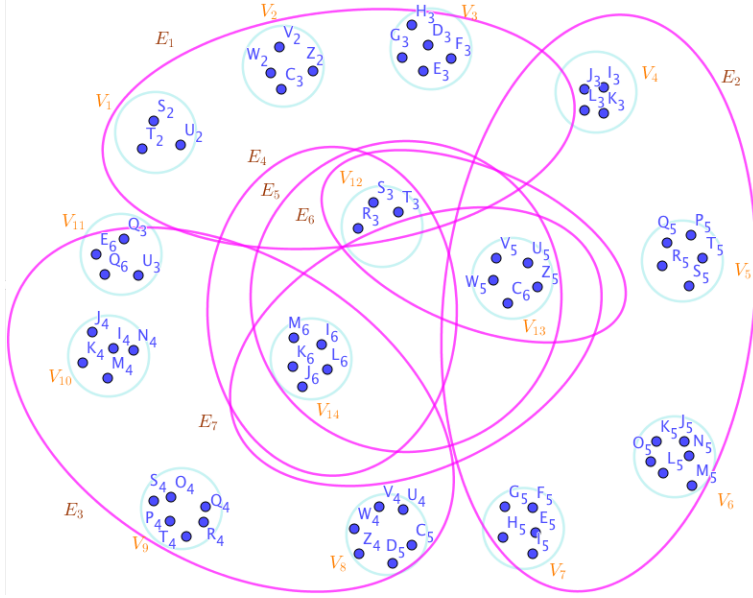


Figure 10.10: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG10

forward.

1815

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0.
 \end{aligned}$$

1816

- On the Figure (30.11), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward.

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= 6z^2 + z^0.
 \end{aligned}$$

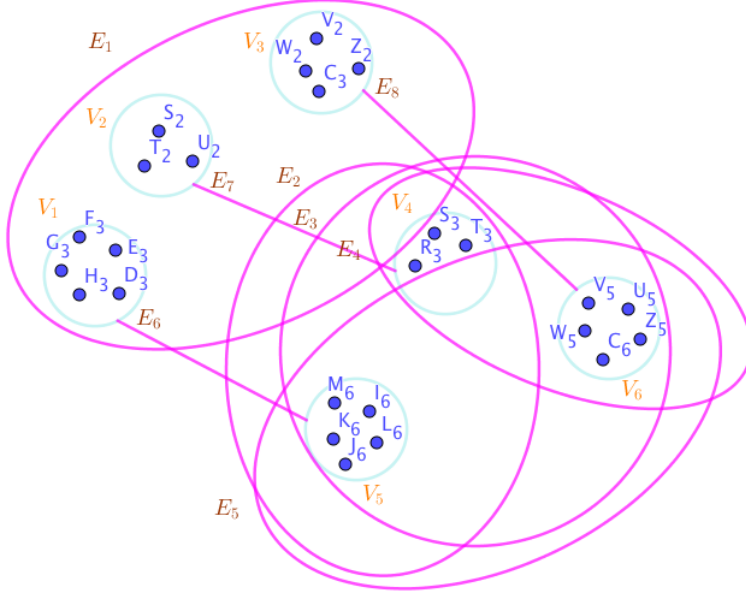


Figure 10.11: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG11

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\ &= \{\{\}\}. \end{aligned}$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

1820

- On the Figure (30.12), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straightforward. 1821 1822 1823

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\ &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^5 + 5z^2 + z^0. \end{aligned}$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\ &= \{\{V_1\}, \{V_2\}, \{V_3\}, \{V_7\}, \{V_8\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^8 + z^7 + 3z^5 + z^0. \end{aligned}$$

1824





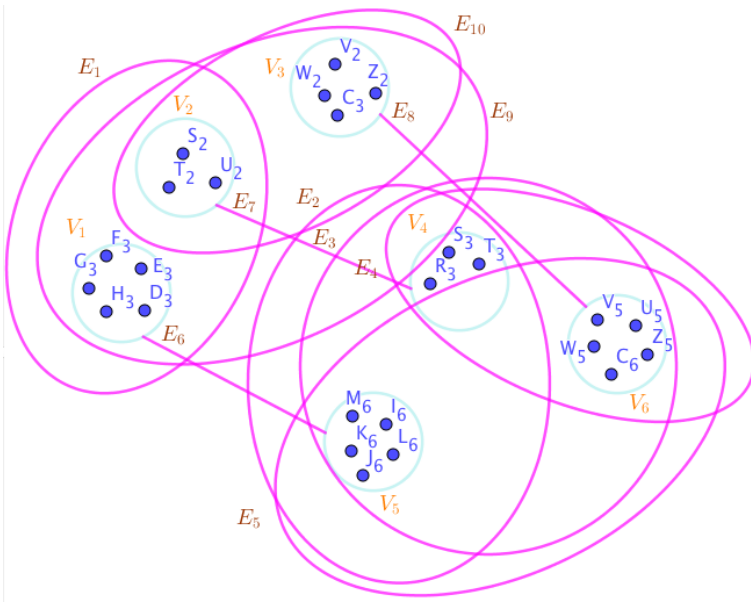


Figure 10.13: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG13

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= 2z^2 + z^0. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{V_1\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^5 + z^0.
 \end{aligned}$$

1832

- On the Figure (30.15), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward.

1833

1834

1835

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= 5z^2. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{V_1\}, \{V_2\}, \{V_3\}, \{V_4\}, \{V_5\}, \{V_6\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= 3z^5 + z^3 + z^0.
 \end{aligned}$$

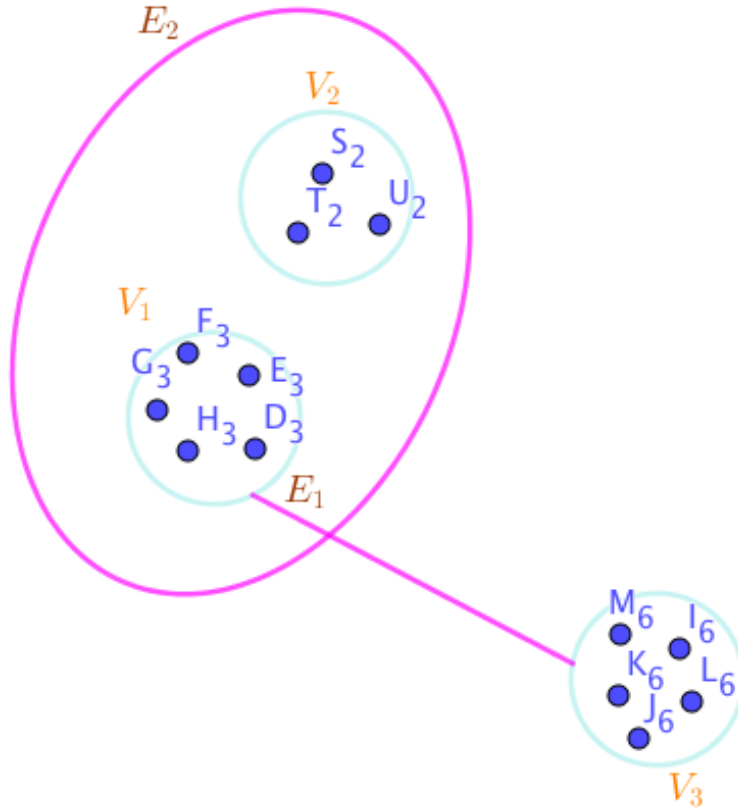


Figure 10.14: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG14

1836

- On the Figure (30.16), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straightforward. 1837  
1838  
1839

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^{10} + z^7 + z^6 + z^5 + z^2 + z^0. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{V_1\}, \{V_2\}, \{V_6\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= 2z^5 + z^3 + z^0.
 \end{aligned}$$

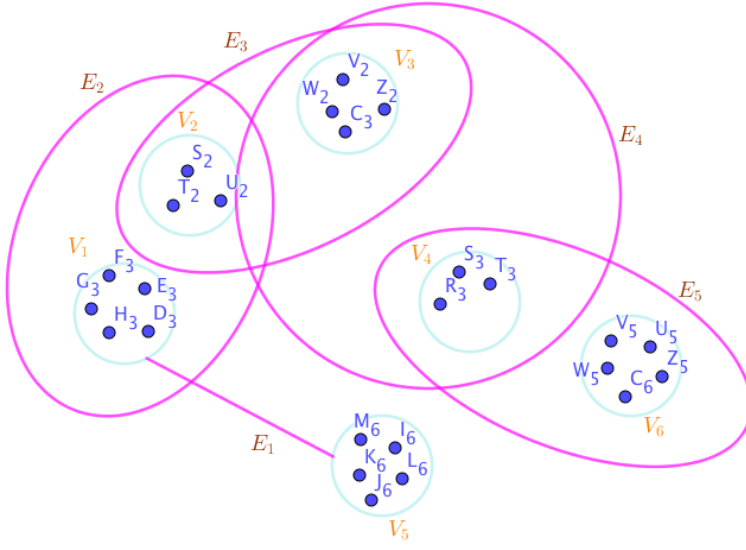


Figure 10.15: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG15

1840

- On the Figure (30.17), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straightforward. 1841 1842 1843

$6\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}}$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\ = \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \end{aligned}$$

$$= z^{10} + z^8 + z^7 + z^6 + z^5 + z^2 + z^0.$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\ = \{\{V_1\}, \{V_2\}, \{V_6\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\ = 2z^5 + z^3 + z^0. \end{aligned}$$

1844

- On the Figure (30.18), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straightforward. 1845 1846 1847

$6\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}}$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\ = \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \end{aligned}$$

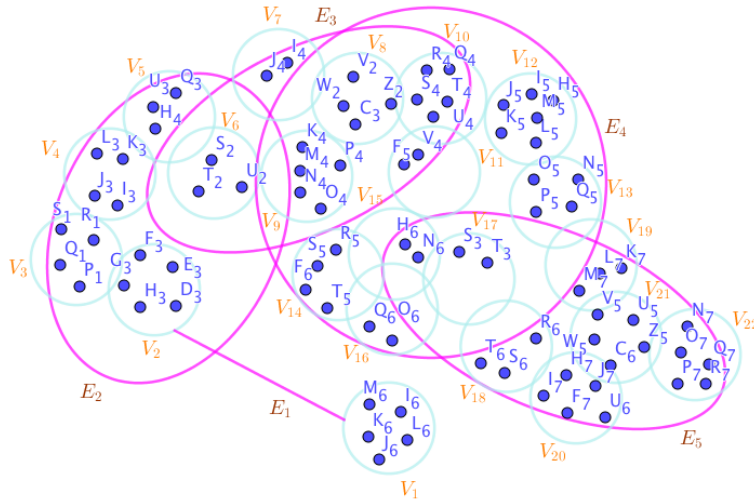


Figure 10.16: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG16

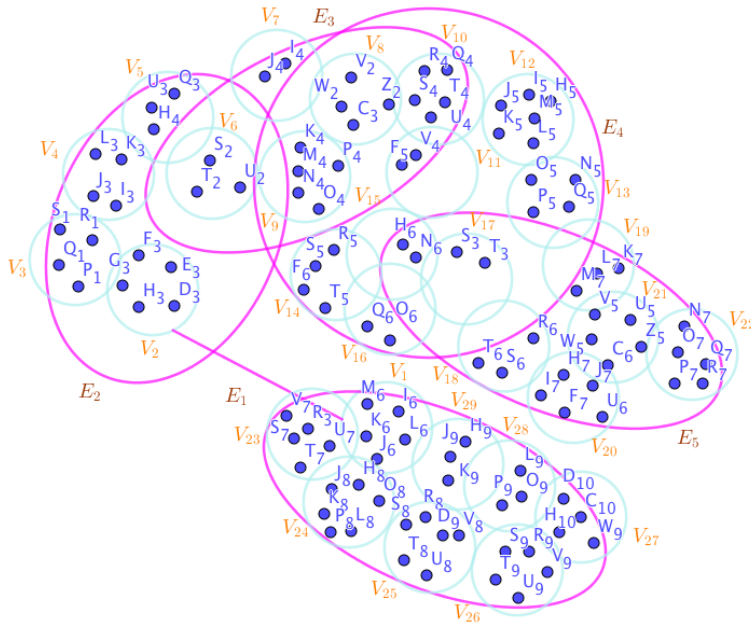


Figure 10.17: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG17

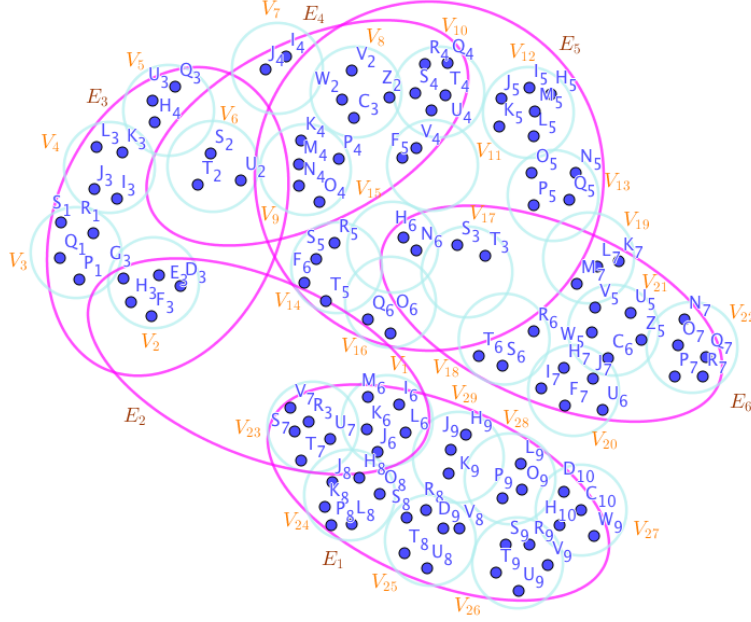


Figure 10.18: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG18

$$= z^{10} + z^8 + z^7 + z^6 + z^5 + z^3 + z^0.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}}$$

$$= \{\{V_2\}, \{V_6\}, \{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^5 + z^3 + z^0.$$

1848

- On the Figure (30.19), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward.

1849

1850

1851

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

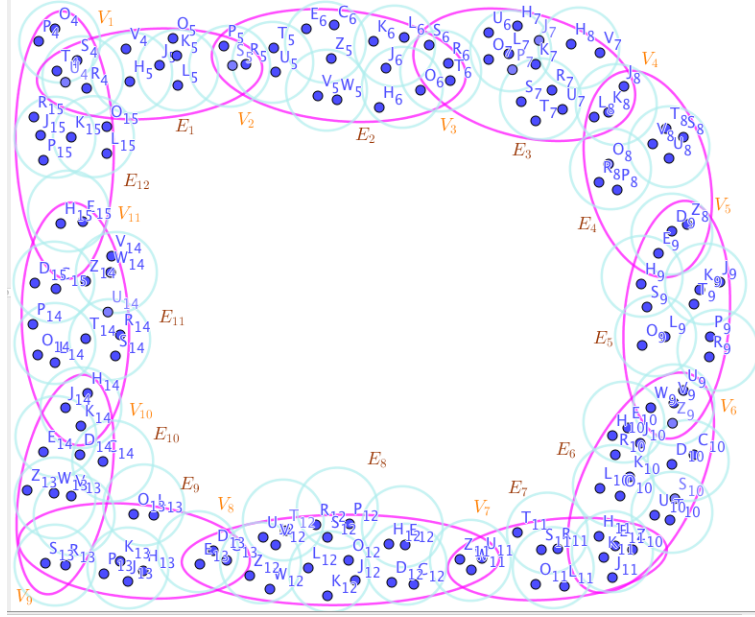


Figure 10.19: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG19

1852

- On the Figure (30.20), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward.

1855

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{V_1\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^6 + z^0.
 \end{aligned}$$

1856

- On the Figure (30.21), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straight-forward.

1859

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}}$$



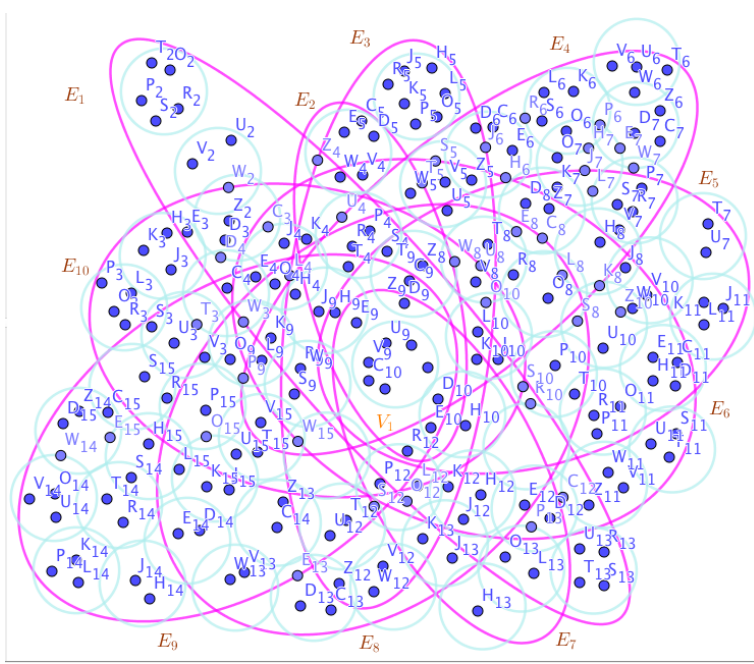


Figure 10.20: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

136NSHG20

$$\begin{aligned}
 &= \{\{E_2\}, \{\}\}. \\
 \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^{10} + z^0. \\
 \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0.
 \end{aligned}$$

1860

- On the Figure (30.22), the Extreme SuperHyperNotion, namely, Extreme SuperHyperVertex-Decomposition, is up. The Extreme Algorithm is Extremely straightforward.

1863

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{\}\}. \\
 \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^{12} + z^{10} + z^9 + z^6 + z^2 + z^0. \\
 \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}}
 \end{aligned}$$

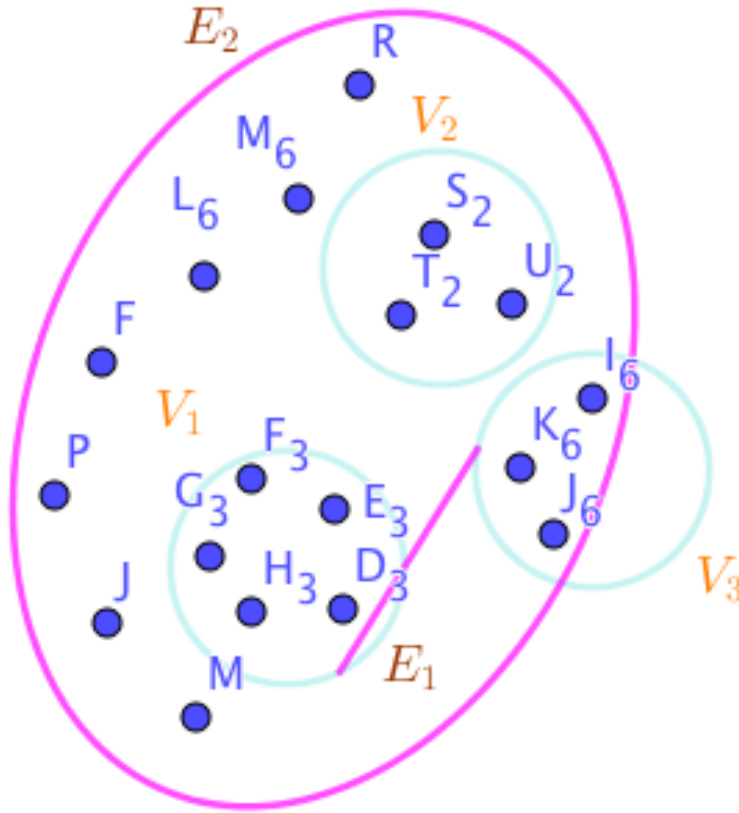


Figure 10.21: The Extreme SuperHyperGraphs Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.3)

95NHG1

$$\begin{aligned}
 &= \{\{V_6\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^4 + z^0.
 \end{aligned}$$

1864

**Proposition 10.0.21.** Assume a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . The all interior Extreme SuperHyperVertices belong to any Extreme quasi-R-Vertex-Decomposition if for any of them, and any of other corresponded Extreme SuperHyperVertex, some interior Extreme SuperHyperVertices are mutually Extreme SuperHyperNeighbors with no Extreme exception at all minus all Extreme SuperHyperNeighbors to any amount of them.

1865  
 1866  
 1867  
 1868  
 1869

**Proposition 10.0.22.** Assume a connected non-obvious Extreme SuperHyperGraph  $ESHG : (V, E)$ . There's only one Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has only the maximum possibilities of the distinct interior Extreme SuperHyperVertices inside of any given Extreme quasi-R-Vertex-Decomposition minus all Extreme SuperHyperNeighbor to some of them but not

1870  
 1871  
 1872  
 1873

95NHG2

**Proposition 10.0.23.** *Assume a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . If an Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has  $z$  Extreme SuperHyperVertices, then the Extreme cardinality of the Extreme R-Vertex-Decomposition is at least*

It's straightforward that the Extreme cardinality of the Extreme R-Vertex-Decomposition is at least the maximum Extreme number of Extreme SuperHyperVertices of the Extreme SuperHyperEdges with the maximum number of the Extreme SuperHyperEdges. In other words, the maximum number of the Extreme SuperHyperEdges contains the maximum Extreme number of Extreme SuperHyperVertices are renamed to Extreme Vertex-Decomposition in some cases but the maximum number of the Extreme SuperHyperEdge with the maximum Extreme number of Extreme SuperHyperVertices, has the Extreme SuperHyperVertices are contained in an Extreme R-Vertex-Decomposition.

$$V \setminus V \setminus \{a_E, b_{E'}, c_{E''}, c_{E'''}\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

If there's an Extreme type-result-R-Vertex-Decomposition with the least Extreme cardinality, the lower sharp Extreme bound for cardinality. 1885  
1886

**Proposition 10.0.25.** Assume a connected loopless Extreme SuperHyperGraph  $ESHG : (V, E)$ . 1887  
Then in the worst case, literally, 1888

$$\mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} = \{V_1, E_1, V_2, E_2, V_3, E_3, V_4, E_4, V_1\}.$$

$$\mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} = z^4.$$

$$\mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} = \{V_1, V_2, V_3, V_4, V_1\}.$$

$$\mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = z^5.$$

Is an Extreme type-result-Vertex-Decomposition. In other words, the least cardinality, the lower sharp bound for the cardinality, of an Extreme type-result-Vertex-Decomposition is the cardinality of 1889  
1890  
1891

$$\mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} = \{V_1, E_1, V_2, E_2, V_3, E_3, V_4, E_4, V_1\}.$$

$$\mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} = z^4.$$

$$\mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} = \{V_1, V_2, V_3, V_4, V_1\}.$$

$$\mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = z^5.$$

*Proof.* Assume a connected loopless Extreme SuperHyperGraph  $ESHG : (V, E)$ . The SuperHyperSet of the SuperHyperVertices  $V \setminus V \setminus \{z\}$  isn't a quasi-R-Vertex-Decomposition since neither amount of Extreme SuperHyperEdges nor amount of SuperHyperVertices where amount refers to the Extreme number of SuperHyperVertices(-/SuperHyperEdges) more than one to form any kind of SuperHyperEdges or any number of SuperHyperEdges. Let us consider the Extreme SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E'} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

This Extreme SuperHyperSet of the Extreme SuperHyperVertices has the eligibilities to propose property such that there's no Extreme SuperHyperVertex of an Extreme SuperHyperEdge is common and there's an Extreme SuperHyperEdge for all Extreme SuperHyperVertices but the maximum Extreme cardinality indicates that these Extreme type-SuperHyperSets couldn't give us the Extreme lower bound in the term of Extreme sharpness. In other words, the Extreme SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E'} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}$$

of the Extreme SuperHyperVertices implies at least on-quasi-triangle style is up but sometimes the Extreme SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E'} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}$$

of the Extreme SuperHyperVertices is free-quasi-triangle and it doesn't make a contradiction to the supposition on the connected loopless Extreme SuperHyperGraph  $ESHG : (V, E)$ . Thus the minimum case never happens in the generality of the connected loopless Extreme SuperHyperGraphs. Thus if we assume in the worst case, literally,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

Is a quasi-R-Vertex-Decomposition. In other words, the least cardinality, the lower sharp bound for the cardinality, of a quasi-R-Vertex-Decomposition is the cardinality of

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

Then we've lost some connected loopless Extreme SuperHyperClasses of the connected loopless Extreme SuperHyperGraphs titled free-triangle, on-triangle, and their quasi-types but the SuperHyperStable is only up in this quasi-R-Vertex-Decomposition. It's the contradiction to that fact on the generality. There are some counterexamples to deny this statement. One of them comes from the setting of the graph titled path and cycle as the counterexamples-classes or reversely direction star as the examples-classes, are well-known classes in that setting and they could be considered as the examples-classes and counterexamples-classes for the tight bound of

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

Let  $V \setminus V \setminus \{z\}$  in mind. There's no necessity on the SuperHyperEdge since we need at least two SuperHyperVertices to form a SuperHyperEdge. It doesn't withdraw the principles of the main definition since there's no condition to be satisfied but the condition is on the existence of the SuperHyperEdge instead of acting on the SuperHyperVertices. In other words, if there's a SuperHyperEdge, then the Extreme SuperHyperSet has the necessary condition for the intended definition to be applied. Thus the  $V \setminus V \setminus \{z\}$  is withdrawn not by the conditions of the main definition but by the necessity of the pre-condition on the usage of the main definition.

The Extreme structure of the Extreme R-Vertex-Decomposition decorates the Extreme SuperHyperVertices don't have received any Extreme connections so as this Extreme style implies different versions of Extreme SuperHyperEdges with the maximum Extreme cardinality in the terms of Extreme SuperHyperVertices are spotlight. The lower Extreme bound is to have the maximum Extreme groups of Extreme SuperHyperVertices have perfect Extreme connections inside each of SuperHyperEdges and the outside of this Extreme SuperHyperSet doesn't matter but regarding the connectedness of the used Extreme SuperHyperGraph arising from its Extreme properties taken from the fact that it's simple. If there's no more than one Extreme SuperHyperVertex in the targeted Extreme SuperHyperSet, then there's no Extreme connection. Furthermore, the Extreme existence of one Extreme SuperHyperVertex has no Extreme effect to talk about the Extreme R-Vertex-Decomposition. Since at least two Extreme SuperHyperVertices involve to make a title in the Extreme background of the Extreme SuperHyperGraph. The Extreme SuperHyperGraph is obvious if it has no Extreme SuperHyperEdge but at least two Extreme SuperHyperVertices make the Extreme version of Extreme SuperHyperEdge. Thus in the Extreme setting of non-obvious Extreme SuperHyperGraph, there are at least one Extreme SuperHyperEdge. It's necessary to mention that the word "Simple" is used as Extreme adjective for the initial Extreme SuperHyperGraph, induces there's no Extreme appearance of the loop Extreme version of the Extreme SuperHyperEdge and this Extreme SuperHyperGraph is said to be loopless. The Extreme adjective "loop" on the basic Extreme framework engages one Extreme SuperHyperVertex but it never happens in this Extreme setting. With these Extreme bases, on an Extreme SuperHyperGraph, there's at least one Extreme SuperHyperEdge thus there's at least an Extreme R-Vertex-Decomposition has the Extreme cardinality of an Extreme SuperHyperEdge. Thus, an Extreme R-Vertex-Decomposition has the Extreme cardinality at least an Extreme SuperHyperEdge. Assume an Extreme SuperHyperSet  $V \setminus V \setminus \{z\}$ . This Extreme SuperHyperSet isn't an Extreme R-Vertex-Decomposition since either the Extreme

SuperHyperGraph is an obvious Extreme SuperHyperModel thus it never happens since there's no Extreme usage of this Extreme framework and even more there's no Extreme connection inside or the Extreme SuperHyperGraph isn't obvious and as its consequences, there's an Extreme contradiction with the term "Extreme R-Vertex-Decomposition" since the maximum Extreme cardinality never happens for this Extreme style of the Extreme SuperHyperSet and beyond that there's no Extreme connection inside as mentioned in first Extreme case in the forms of drawback for this selected Extreme SuperHyperSet. Let

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E'} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}$$

Comes up. This Extreme case implies having the Extreme style of on-quasi-triangle Extreme style on the every Extreme elements of this Extreme SuperHyperSet. Precisely, the Extreme R-Vertex-Decomposition is the Extreme SuperHyperSet of the Extreme SuperHyperVertices such that some Extreme amount of the Extreme SuperHyperVertices are on-quasi-triangle Extreme style. The Extreme cardinality of the v SuperHypeSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E'} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}$$

Is the maximum in comparison to the Extreme SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

But the lower Extreme bound is up. Thus the minimum Extreme cardinality of the maximum Extreme cardinality ends up the Extreme discussion. The first Extreme term refers to the Extreme setting of the Extreme SuperHyperGraph but this key point is enough since there's an Extreme SuperHyperClass of an Extreme SuperHyperGraph has no on-quasi-triangle Extreme style amid some amount of its Extreme SuperHyperVertices. This Extreme setting of the Extreme SuperHyperModel proposes an Extreme SuperHyperSet has only some amount Extreme SuperHyperVertices from one Extreme SuperHyperEdge such that there's no Extreme amount of Extreme SuperHyperEdges more than one involving these some amount of these Extreme SuperHyperVertices. The Extreme cardinality of this Extreme SuperHyperSet is the maximum and the Extreme case is occurred in the minimum Extreme situation. To sum them up, the Extreme SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

Has the maximum Extreme cardinality such that

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

Contains some Extreme SuperHyperVertices such that there's distinct-covers-order-amount Extreme SuperHyperEdges for amount of Extreme SuperHyperVertices taken from the Extreme SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

It means that the Extreme SuperHyperSet of the Extreme SuperHyperVertices

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

Is an Extreme R-Vertex-Decomposition for the Extreme SuperHyperGraph as used Extreme background in the Extreme terms of worst Extreme case and the common theme of the lower Extreme bound occurred in the specific Extreme SuperHyperClasses of the Extreme SuperHyperGraphs which are Extreme free-quasi-triangle.

Assume an Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has  $z$  Extreme number of the Extreme SuperHyperVertices. Then every Extreme SuperHyperVertex has at least no Extreme SuperHyperEdge with others in common. Thus those Extreme SuperHyperVertices have the eligibles to be contained in an Extreme R-Vertex-Decomposition. Those Extreme SuperHyperVertices are potentially included in an Extreme style-R-Vertex-Decomposition. Formally, consider

$$V \setminus (V \setminus \{a_E, b_E, c_E, \dots, z_E\}).$$

Are the Extreme SuperHyperVertices of an Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$ . Thus

$$Z_i \sim Z_j, i \neq j, i, j = 1, 2, \dots, z.$$

where the  $\sim$  isn't an equivalence relation but only the symmetric relation on the Extreme SuperHyperVertices of the Extreme SuperHyperGraph. The formal definition is as follows.

$$Z_i \sim Z_j, i \neq j, i, j = 1, 2, \dots, z$$

if and only if  $Z_i$  and  $Z_j$  are the Extreme SuperHyperVertices and there's only and only one Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  between the Extreme SuperHyperVertices  $Z_i$  and  $Z_j$ . The other definition for the Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  in the terms of Extreme R-Vertex-Decomposition is

$$\{a_E, b_E, c_E, \dots, z_E\}.$$

This definition coincides with the definition of the Extreme R-Vertex-Decomposition but with slightly differences in the maximum Extreme cardinality amid those Extreme type-SuperHyperSets of the Extreme SuperHyperVertices. Thus the Extreme SuperHyperSet of the Extreme SuperHyperVertices,

$$\max_z |\{Z_1, Z_2, \dots, Z_z \mid Z_i \sim Z_j, i \neq j, i, j = 1, 2, \dots, z\}|_{\text{Extreme cardinality}},$$

and

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

is formalized with mathematical literatures on the Extreme R-Vertex-Decomposition. Let  $Z_i \overset{E}{\sim} Z_j$ , be defined as  $Z_i$  and  $Z_j$  are the Extreme SuperHyperVertices belong to the Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$ . Thus,

$$E = \{Z_1, Z_2, \dots, Z_z \mid Z_i \overset{E}{\sim} Z_j, i \neq j, i, j = 1, 2, \dots, z\}.$$

Or

$$\{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

But with the slightly differences,

1892

Extreme R-Vertex-Decomposition =

$$\{Z_1, Z_2, \dots, Z_z \mid \forall i \neq j, i, j = 1, 2, \dots, z, \exists E_x, Z_i \overset{E_x}{\sim} Z_j\}.$$



$$\text{Extreme R-Vertex-Decomposition} = \\
 V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}$$

Thus  $E \in E_{ESHG:(V,E)}$  is an Extreme quasi-R-Vertex-Decomposition where  $E \in E_{ESHG:(V,E)}$  is fixed that means  $E_x = E \in E_{ESHG:(V,E)}$ . for all Extreme intended SuperHyperVertices but in an Extreme Vertex-Decomposition,  $E_x = E \in E_{ESHG:(V,E)}$  could be different and it's not unique. To sum them up, in a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . If an Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has  $z$  Extreme SuperHyperVertices, then the Extreme cardinality of the Extreme R-Vertex-Decomposition is at least

$$V \setminus (V \setminus \{a_E, b_E, c_E, \dots, z_E\}).$$

It's straightforward that the Extreme cardinality of the Extreme R-Vertex-Decomposition is at least the maximum Extreme number of Extreme SuperHyperVertices of the Extreme SuperHyperEdges with the maximum number of the Extreme SuperHyperEdges. In other words, the maximum number of the Extreme SuperHyperEdges contains the maximum number of Extreme SuperHyperVertices are renamed to Extreme Vertex-Decomposition in some cases but the maximum number of the Extreme SuperHyperEdge with the maximum number of Extreme SuperHyperVertices, has the Extreme SuperHyperVertices are contained in an Extreme R-Vertex-Decomposition.

The obvious SuperHyperGraph has no Extreme SuperHyperEdges. But the non-obvious Extreme SuperHyperModel is up. The quasi-SuperHyperModel addresses some issues about the Extreme optimal SuperHyperObject. It specially delivers some remarks on the Extreme SuperHyperSet of the Extreme SuperHyperVertices such that there's distinct amount of Extreme SuperHyperEdges for distinct amount of Extreme SuperHyperVertices up to all taken from that Extreme SuperHyperSet of the Extreme SuperHyperVertices but this Extreme SuperHyperSet of the Extreme SuperHyperVertices is either has the maximum Extreme SuperHyperCardinality or it doesn't have maximum Extreme SuperHyperCardinality. In a non-obvious SuperHyperModel, there's at least one Extreme SuperHyperEdge containing at least all Extreme SuperHyperVertices. Thus it forms an Extreme quasi-R-Vertex-Decomposition where the Extreme completion of the Extreme incidence is up in that. Thus it's, literarily, an Extreme embedded R-Vertex-Decomposition. The SuperHyperNotions of embedded SuperHyperSet and quasi-SuperHyperSet coincide. In the original setting, these types of SuperHyperSets only don't satisfy on the maximum SuperHyperCardinality. Thus the embedded setting is elected such that those SuperHyperSets have the maximum Extreme SuperHyperCardinality and they're Extreme SuperHyperOptimal. The less than two distinct types of Extreme SuperHyperVertices are included in the minimum Extreme style of the embedded Extreme R-Vertex-Decomposition. The interior types of the Extreme SuperHyperVertices are deciders. Since the Extreme number of SuperHyperNeighbors are only affected by the interior Extreme SuperHyperVertices. The common connections, more precise and more formal, the perfect unique connections inside the Extreme SuperHyperSet for any distinct types of Extreme SuperHyperVertices pose the Extreme R-Vertex-Decomposition. Thus Extreme exterior SuperHyperVertices could be used only in one Extreme SuperHyperEdge and in Extreme SuperHyperRelation with the interior Extreme SuperHyperVertices in that Extreme SuperHyperEdge. In the embedded Extreme Vertex-Decomposition, there's the usage of exterior Extreme SuperHyperVertices since they've

more connections inside more than outside. Thus the title “exterior” is more relevant than the title “interior”. One Extreme SuperHyperVertex has no connection, inside. Thus, the Extreme SuperHyperSet of the Extreme SuperHyperVertices with one SuperHyperElement has been ignored in the exploring to lead on the optimal case implying the Extreme R-Vertex-Decomposition. The Extreme R-Vertex-Decomposition with the exclusion of the exclusion of all Extreme SuperHyperVertices in one Extreme SuperHyperEdge and with other terms, the Extreme R-Vertex-Decomposition with the inclusion of all Extreme SuperHyperVertices in one Extreme SuperHyperEdge, is an Extreme quasi-R-Vertex-Decomposition. To sum them up, in a connected non-obvious Extreme SuperHyperGraph  $ESHG : (V, E)$ . There’s only one Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has only the maximum possibilities of the distinct interior Extreme SuperHyperVertices inside of any given Extreme quasi-R-Vertex-Decomposition minus all Extreme SuperHyperNeighbor to some of them but not all of them. In other words, there’s only an unique Extreme SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has only two distinct Extreme SuperHyperVertices in an Extreme quasi-R-Vertex-Decomposition, minus all Extreme SuperHyperNeighbor to some of them but not all of them.

The main definition of the Extreme R-Vertex-Decomposition has two titles. an Extreme quasi-R-Vertex-Decomposition and its corresponded quasi-maximum Extreme R-SuperHyperCardinality are two titles in the terms of quasi-R-styles. For any Extreme number, there’s an Extreme quasi-R-Vertex-Decomposition with that quasi-maximum Extreme SuperHyperCardinality in the terms of the embedded Extreme SuperHyperGraph. If there’s an embedded Extreme SuperHyperGraph, then the Extreme quasi-SuperHyperNotions lead us to take the collection of all the Extreme quasi-R-Vertex-Decompositions for all Extreme numbers less than its Extreme corresponded maximum number. The essence of the Extreme Vertex-Decomposition ends up but this essence starts up in the terms of the Extreme quasi-R-Vertex-Decomposition, again and more in the operations of collecting all the Extreme quasi-R-Vertex-Decompositions acted on the all possible used formations of the Extreme SuperHyperGraph to achieve one Extreme number. This Extreme number is considered as the equivalence class for all corresponded quasi-R-Vertex-Decompositions. Let  $z_{\text{Extreme Number}}, S_{\text{Extreme SuperHyperSet}}$  and  $G_{\text{Extreme Vertex-Decomposition}}$  be an Extreme number, an Extreme SuperHyperSet and an Extreme Vertex-Decomposition. Then

$$\begin{aligned} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} &= \{S_{\text{Extreme SuperHyperSet}} \mid \\ &S_{\text{Extreme SuperHyperSet}} = G_{\text{Extreme Vertex-Decomposition}}, \\ &|S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\ &= z_{\text{Extreme Number}}\}. \end{aligned}$$

As its consequences, the formal definition of the Extreme Vertex-Decomposition is re-formalized and redefined as follows.

$$\begin{aligned} G_{\text{Extreme Vertex-Decomposition}} &\in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} = \\ &\cup_{z_{\text{Extreme Number}}} \{S_{\text{Extreme SuperHyperSet}} \mid \\ &S_{\text{Extreme SuperHyperSet}} = G_{\text{Extreme Vertex-Decomposition}}, \\ &|S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\ &= z_{\text{Extreme Number}}\}. \end{aligned}$$

To get more precise perceptions, the follow-up expressions propose another formal technical

definition for the Extreme Vertex-Decomposition.

1960

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid \\
 \cup_{z_{\text{Extreme Number}}} \{S_{\text{Extreme SuperHyperSet}} \mid \\
 S_{\text{Extreme SuperHyperSet}} &= G_{\text{Extreme Vertex-Decomposition}}, \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\
 &= z_{\text{Extreme Number}} \mid \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\
 &= \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \}.
 \end{aligned}$$

In more concise and more convenient ways, the modified definition for the Extreme Vertex-Decomposition poses the upcoming expressions.

1961

1962

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\
 &= \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \}.
 \end{aligned}$$

To translate the statement to this mathematical literature, the formulae will be revised.

1963

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\
 &= \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \\
 &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}.
 \end{aligned}$$

And then,

1964

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\
 &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}.
 \end{aligned}$$

To get more visions in the closer look-up, there's an overall overlook.

1965

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} &= \\
 \cup_{z_{\text{Extreme Number}}} \{S_{\text{Extreme SuperHyperSet}} \mid \\
 S_{\text{Extreme SuperHyperSet}} &= G_{\text{Extreme Vertex-Decomposition}}, \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\
 &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}.
 \end{aligned}$$

1966

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} &= \\
 \cup_{z_{\text{Extreme Number}}} \{S_{\text{Extreme SuperHyperSet}} \mid & \\
 S_{\text{Extreme SuperHyperSet}} = G_{\text{Extreme Vertex-Decomposition}}, & \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} & \\
 = z_{\text{Extreme Number}} \mid & \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} & \\
 = \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. &
 \end{aligned}$$

1967

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid & \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} & \\
 = \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} & \\
 = \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. &
 \end{aligned}$$

1968

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid & \\
 |S_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} & \\
 = \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. &
 \end{aligned}$$

Now, the extension of these types of approaches is up. Since the new term, “Extreme Super-  
HyperNeighborhood”, could be redefined as the collection of the Extreme SuperHyperVertices  
such that any amount of its Extreme SuperHyperVertices are incident to an Extreme SuperHy-  
perEdge. It’s, literarily, another name for “Extreme Quasi-Vertex-Decomposition” but, precisely,  
it’s the generalization of “Extreme Quasi-Vertex-Decomposition” since “Extreme Quasi-Vertex-  
Decomposition” happens “Extreme Vertex-Decomposition” in an Extreme SuperHyperGraph as  
initial framework and background but “Extreme SuperHyperNeighborhood” may not happens  
“Extreme Vertex-Decomposition” in an Extreme SuperHyperGraph as initial framework and  
preliminarily background since there are some ambiguities about the Extreme SuperHyperCar-  
dinality arise from it. To get orderly keywords, the terms, “Extreme SuperHyperNeighborhood”,  
“Extreme Quasi-Vertex-Decomposition”, and “Extreme Vertex-Decomposition” are up.  
Thus, let  $z_{\text{Extreme Number}}$ ,  $N_{\text{Extreme SuperHyperNeighborhood}}$  and  $G_{\text{Extreme Vertex-Decomposition}}$  be an  
Extreme number, an Extreme SuperHyperNeighborhood and an Extreme Vertex-Decomposition  
and the new terms are up.

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} &= \\
 \cup_{z_{\text{Extreme Number}}} \{N_{\text{Extreme SuperHyperNeighborhood}} \mid & \\
 |N_{\text{Extreme SuperHyperNeighborhood}}|_{\text{Extreme Cardinality}} & \\
 = \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \}. &
 \end{aligned}$$

1983

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{N_{\text{Extreme SuperHyperNeighborhood}} & \\
 \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} &= \\
 \cup_{z_{\text{Extreme Number}}} \{N_{\text{Extreme SuperHyperNeighborhood}} \mid & \\
 |N_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} & \\
 = z_{\text{Extreme Number}} \mid & \\
 |N_{\text{Extreme SuperHyperNeighborhood}}|_{\text{Extreme Cardinality}} & \\
 = \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \}. &
 \end{aligned}$$

1984

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{N_{\text{Extreme SuperHyperNeighborhood}} & \\
 \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid & \\
 |N_{\text{Extreme SuperHyperNeighborhood}}|_{\text{Extreme Cardinality}} & \\
 = \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \}. &
 \end{aligned}$$

1985

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{N_{\text{Extreme SuperHyperNeighborhood}} & \\
 \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid & \\
 |N_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} & \\
 = \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \}. &
 \end{aligned}$$

And with go back to initial structure,

1986

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} &= \\
 \cup_{z_{\text{Extreme Number}}} \{N_{\text{Extreme SuperHyperNeighborhood}} \mid & \\
 |N_{\text{Extreme SuperHyperNeighborhood}}|_{\text{Extreme Cardinality}} & \\
 = \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. &
 \end{aligned}$$

1987

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 \{N_{\text{Extreme SuperHyperNeighborhood}} & \\
 \in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} &= \\
 \cup_{z_{\text{Extreme Number}}} \{N_{\text{Extreme SuperHyperNeighborhood}} \mid & \\
 |N_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} & \\
 = z_{\text{Extreme Number}} \mid & \\
 |N_{\text{Extreme SuperHyperNeighborhood}}|_{\text{Extreme Cardinality}} & \\
 = \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. &
 \end{aligned}$$

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 &\{N_{\text{Extreme SuperHyperNeighborhood}} \\
 &\in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid \\
 &|N_{\text{Extreme SuperHyperNeighborhood}}|_{\text{Extreme Cardinality}} \\
 &= \max_{[z_{\text{Extreme Number}}]_{\text{Extreme Class}}} z_{\text{Extreme Number}} \\
 &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}.
 \end{aligned}$$

$$\begin{aligned}
 G_{\text{Extreme Vertex-Decomposition}} &= \\
 &\{N_{\text{Extreme SuperHyperNeighborhood}} \\
 &\in \cup_{z_{\text{Extreme Number}}} [z_{\text{Extreme Number}}]_{\text{Extreme Class}} \mid \\
 &|N_{\text{Extreme SuperHyperSet}}|_{\text{Extreme Cardinality}} \\
 &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}.
 \end{aligned}$$

Thus, in a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . The all interior Extreme SuperHyperVertices belong to any Extreme quasi-R-Vertex-Decomposition if for any of them, and any of other corresponded Extreme SuperHyperVertex, some interior Extreme SuperHyperVertices are mutually Extreme SuperHyperNeighbors with no Extreme exception at all minus all Extreme SuperHyperNeighbors to any amount of them.

To make sense with the precise words in the terms of “R-”, the follow-up illustrations are coming up.

The following Extreme SuperHyperSet of Extreme SuperHyperVertices is the simple Extreme type-SuperHyperSet of the Extreme R-Vertex-Decomposition.

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

The Extreme SuperHyperSet of Extreme SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

Is the simple Extreme type-SuperHyperSet of the Extreme R-Vertex-Decomposition. The Extreme SuperHyperSet of the Extreme SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

Is an **Extreme R-Vertex-Decomposition**  $\mathcal{C}(ESHG)$  for an Extreme SuperHyperGraph  $ESHG : (V, E)$  is an Extreme type-SuperHyperSet with

**the maximum Extreme cardinality** of an Extreme SuperHyperSet  $S$  of Extreme SuperHyperVertices such that there's no an Extreme SuperHyperEdge amid some Extreme SuperHyperVertices instead of all given by **Extreme Vertex-Decomposition** is related to the Extreme SuperHyperSet of the Extreme SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

There's not only **one** Extreme SuperHyperVertex **inside** the intended Extreme SuperHyperSet. Thus the non-obvious Extreme Vertex-Decomposition is up. The obvious simple Extreme type-SuperHyperSet called the Extreme Vertex-Decomposition is an Extreme SuperHyperSet **includes** only **one** Extreme SuperHyperVertex. But the Extreme SuperHyperSet of Extreme SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

doesn't have less than two SuperHyperVertices **inside** the intended Extreme SuperHyperSet since they've come from at least so far an SuperHyperEdge. Thus the non-obvious simple Extreme type-SuperHyperSet of the Extreme R-Vertex-Decomposition **is** up. To sum them up, the Extreme SuperHyperSet of Extreme SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

**Is** the non-obvious simple Extreme type-SuperHyperSet of the Extreme R-Vertex-Decomposition. Since the Extreme SuperHyperSet of the Extreme SuperHyperVertices,

$$(V \setminus V \setminus \{x, z\}) \cup \{xy\}$$

or

$$(V \setminus V \setminus \{x, z\}) \cup \{zy\}$$

is an Extreme R-Vertex-Decomposition  $\mathcal{C}(ESHG)$  for an Extreme SuperHyperGraph  $ESHG : (V, E)$  is the Extreme SuperHyperSet  $S$  of Extreme SuperHyperVertices such that there's no an Extreme SuperHyperEdge for some Extreme SuperHyperVertices instead of all given by that Extreme type-SuperHyperSet called the Extreme Vertex-Decomposition **and** it's an Extreme **Vertex-Decomposition**. Since it's

**the maximum Extreme cardinality** of an Extreme SuperHyperSet  $S$  of Extreme SuperHyperVertices such that there's no an Extreme SuperHyperEdge for some amount Extreme SuperHyperVertices instead of all given by that Extreme type-SuperHyperSet called the Extreme Vertex-Decomposition. There isn't only less than two Extreme SuperHyperVertices **inside** the intended Extreme SuperHyperSet,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

Thus the non-obvious Extreme R-Vertex-Decomposition,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

is up. The non-obvious simple Extreme type-SuperHyperSet of the Extreme Vertex-Decomposition, not:

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

Is the Extreme SuperHyperSet, not:

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$



does includes only less than two SuperHyperVertices in a connected Extreme SuperHyperGraph  $ESHG : (V, E)$  but it's impossible in the case, they've corresponded to an SuperHyperEdge. It's interesting to mention that the only non-obvious simple Extreme type-SuperHyperSet called the

**“Extreme R-Vertex-Decomposition”**

amid those obvious[non-obvious] simple Extreme type-SuperHyperSets called the

**Extreme R-Vertex-Decomposition,**

is only and only

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}} \cdot$$

In a connected Extreme SuperHyperGraph  $ESHG : (V, E)$  with a illustrated SuperHyper-Modeling. It's also, not only an Extreme free-triangle embedded SuperHyperModel and an Extreme on-triangle embedded SuperHyperModel but also it's an Extreme stable embedded SuperHyperModel. But all only non-obvious simple Extreme type-SuperHyperSets of the Extreme R-Vertex-Decomposition amid those obvious simple Extreme type-SuperHyperSets of the Extreme Vertex-Decomposition, are

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}} \cdot$$

In a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ .

To sum them up, assume a connected loopless Extreme SuperHyperGraph  $ESHG : (V, E)$ . Then in the worst case, literally,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}} \cdot$$

is an Extreme R-Vertex-Decomposition. In other words, the least cardinality, the lower sharp bound for the cardinality, of an Extreme R-Vertex-Decomposition is the cardinality of

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}} \cdot$$

To sum them up, in a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . The all interior Extreme SuperHyperVertices belong to any Extreme quasi-R-Vertex-Decomposition if for any of them, and any of other corresponded Extreme SuperHyperVertex, some interior Extreme SuperHyperVertices are mutually Extreme SuperHyperNeighbors with no Extreme exception at all minus all Extreme SuperHypeNeighbors to any amount of them.

Assume a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . Let an Extreme SuperHyperEdge  $ESHE : E \in E_{ESHG:(V,E)}$  has some Extreme SuperHyperVertices  $r$ . Consider all Extreme numbers of those Extreme SuperHyperVertices from that Extreme SuperHyperEdge excluding excluding more than  $r$  distinct Extreme SuperHyperVertices, exclude to any given Extreme SuperHyperSet of the Extreme SuperHyperVertices. Consider there's an Extreme R-Vertex-Decomposition with the least cardinality, the lower sharp Extreme bound for Extreme cardinality. Assume a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . The Extreme SuperHyperSet of the Extreme SuperHyperVertices  $V_{ESHE} \setminus \{z\}$  is an Extreme SuperHyperSet

$S$  of the Extreme SuperHyperVertices such that there's an Extreme SuperHyperEdge to have some Extreme SuperHyperVertices uniquely but it isn't an Extreme R-Vertex-Decomposition. Since it doesn't have

**the maximum Extreme cardinality** of an Extreme SuperHyperSet  $S$  of Extreme SuperHyperVertices such that there's an Extreme SuperHyperEdge to have some SuperHyperVertices uniquely. The Extreme SuperHyperSet of the Extreme SuperHyperVertices  $V_{ESHE} \cup \{z\}$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of Extreme SuperHyperVertices but it isn't an Extreme R-Vertex-Decomposition. Since it **doesn't do** the Extreme procedure such that such that there's an Extreme SuperHyperEdge to have some Extreme SuperHyperVertices uniquely [there are at least one Extreme SuperHyperVertex outside implying there's, sometimes in the connected Extreme SuperHyperGraph  $ESHG : (V, E)$ , an Extreme SuperHyperVertex, titled its Extreme SuperHyperNeighbor, to that Extreme SuperHyperVertex in the Extreme SuperHyperSet  $S$  so as  $S$  doesn't do "the Extreme procedure"]. There's only **one** Extreme SuperHyperVertex **outside** the intended Extreme SuperHyperSet,  $V_{ESHE} \cup \{z\}$ , in the terms of Extreme SuperHyperNeighborhood. Thus the obvious Extreme R-Vertex-Decomposition,  $V_{ESHE}$  is up. The obvious simple Extreme type-SuperHyperSet of the Extreme R-Vertex-Decomposition,  $V_{ESHE}$ , **is** an Extreme SuperHyperSet,  $V_{ESHE}$ , **includes** only **all** Extreme SuperHyperVertices does forms any kind of Extreme pairs are titled Extreme SuperHyperNeighbors in a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . Since the Extreme SuperHyperSet of the Extreme SuperHyperVertices  $V_{ESHE}$ , is the **maximum Extreme SuperHyperCardinality** of an Extreme SuperHyperSet  $S$  of Extreme SuperHyperVertices **such that** there's an Extreme SuperHyperEdge to have some Extreme SuperHyperVertices uniquely. Thus, in a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . Any Extreme R-Vertex-Decomposition only contains all interior Extreme SuperHyperVertices and all exterior Extreme SuperHyperVertices from the unique Extreme SuperHyperEdge where there's any of them has all possible Extreme SuperHyperNeighbors in and there's all Extreme SuperHyperNeighborhoods in with no exception minus all Extreme SuperHyperNeighbors to some of them not all of them but everything is possible about Extreme SuperHyperNeighborhoods and Extreme SuperHyperNeighbors out. The SuperHyperNotion, namely, Vertex-Decomposition, is up. There's neither empty SuperHyperEdge nor loop SuperHyperEdge. The following Extreme SuperHyperSet of Extreme SuperHyperEdges[SuperHyperVertices] is the simple Extreme type-SuperHyperSet of the Extreme Vertex-Decomposition. The Extreme SuperHyperSet of Extreme SuperHyperEdges[SuperHyperVertices],

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|E_{ESHG:(V,E)}| \text{Extreme Cardinality}}{2} \rfloor} \\
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} \\
 &= 2z^{\lfloor \frac{|E_{ESHG:(V,E)}| \text{Extreme Cardinality}}{2} \rfloor} \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t.
 \end{aligned}$$

is the simple Extreme type-SuperHyperSet of the Extreme Vertex-Decomposition. The Extreme

SuperHyperSet of the Extreme SuperHyperEdges[SuperHyperVertices],

2047

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor}. \\
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor}. \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t.
 \end{aligned}$$

Is an **Extreme Vertex-Decomposition**  $\mathcal{C}(ESHG)$  for an Extreme SuperHyperGraph  $ESHG : (V, E)$  is an Extreme type-SuperHyperSet with

2048

2049

2050

**the maximum Extreme cardinality** of an Extreme SuperHyperSet  $S$  of Extreme SuperHyperEdges[SuperHyperVertices] such that there's no Extreme SuperHyperVertex of an Extreme SuperHyperEdge is common and there's an Extreme SuperHyperEdge for all Extreme SuperHyperVertices. There are not only **two** Extreme SuperHyperVertices **inside** the intended Extreme SuperHyperSet. Thus the non-obvious Extreme Vertex-Decomposition is up. The obvious simple Extreme type-SuperHyperSet called the Extreme Vertex-Decomposition is an Extreme SuperHyperSet **includes** only **two** Extreme SuperHyperVertices. But the Extreme SuperHyperSet of the Extreme SuperHyperEdges[SuperHyperVertices],

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor}. \\
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor}. \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t.
 \end{aligned}$$

Doesn't have less than three SuperHyperVertices **inside** the intended Extreme SuperHyperSet. Thus the non-obvious simple Extreme type-SuperHyperSet of the Extreme Vertex-Decomposition **is** up. To sum them up, the Extreme SuperHyperSet of the Extreme SuperHyperEdges[SuperHyperVertices],

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor}. \\
 & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor}. \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\
 & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t.
 \end{aligned}$$

Is the non-obvious simple Extreme type-SuperHyperSet of the Extreme Vertex-Decomposition. 2063  
Since the Extreme SuperHyperSet of the Extreme SuperHyperEdges[SuperHyperVertices], 2064

$$\begin{aligned} & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} \\ &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor} \\ & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} \\ &= 2z^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor} \\ & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\ & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t. \end{aligned}$$

Is an Extreme Vertex-Decomposition  $\mathcal{C}(ESHG)$  for an Extreme SuperHyperGraph  $ESHG : (V, E)$  is the Extreme SuperHyperSet  $S$  of Extreme SuperHyperVertices such that there's no an Extreme SuperHyperEdge for some Extreme SuperHyperVertices given by that Extreme type-SuperHyperSet called the Extreme Vertex-Decomposition and it's an Extreme Vertex-Decomposition. Since it's

the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of Extreme SuperHyperEdges[SuperHyperVertices] such that there's no Extreme SuperHyperVertex of an Extreme SuperHyperEdge is common and there's an Extreme SuperHyperEdge for all Extreme SuperHyperVertices. There aren't only less than three Extreme SuperHyperVertices inside the intended Extreme SuperHyperSet,

$$\begin{aligned} & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} \\ &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor} \\ & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} \\ &= 2z^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor} \\ & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\ & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t. \end{aligned}$$

Thus the non-obvious Extreme Vertex-Decomposition,

$$\begin{aligned} & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition} \\ &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor} \\ & \mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial} \\ &= 2z^{\lfloor \frac{|ESHG:(V,E)|_{Extreme\ Cardinality}}{2} \rfloor} \\ & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\ & \mathcal{C}(NSHG)_{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t. \end{aligned}$$

Is up. The obvious simple Extreme type-SuperHyperSet of the Extreme Vertex-Decomposition, not:

$$\mathcal{C}(NSHG)_{ExtremeQuasi-Vertex-Decomposition}$$

$$\begin{aligned}
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Extreme Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Extreme Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{ExtremeR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t \\
 &\mathcal{C}(NSHG)_{\text{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
 \end{aligned}$$

Is the Extreme SuperHyperSet, not:

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{ExtremeQuasi-Vertex-Decomposition}} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Extreme Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Extreme Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{ExtremeR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t \\
 &\mathcal{C}(NSHG)_{\text{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
 \end{aligned}$$

Does includes only less than three SuperHyperVertices in a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ . It's interesting to mention that the only non-obvious simple Extreme type-SuperHyperSet called the

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### “Extreme Vertex-Decomposition”

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amid those obvious[non-obvious] simple Extreme type-SuperHyperSets called the

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### Extreme Vertex-Decomposition,

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is only and only

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{ExtremeQuasi-Vertex-Decomposition}} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Extreme Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{ExtremeQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Extreme Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{ExtremeR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t \\
 &\mathcal{C}(NSHG)_{\text{ExtremeR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
 \end{aligned}$$

In a connected Extreme SuperHyperGraph  $ESHG : (V, E)$ .

■ 2087



## CHAPTER 11

2088

# The Extreme Departures on The Theoretical Results Toward Theoretical Motivations

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The previous Extreme approach apply on the upcoming Extreme results on Extreme SuperHyperClasses.

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**Proposition 11.0.1.** Assume a connected Extreme SuperHyperPath  $ESHP : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{E_i\}_{i \neq 1, |E_{NSHG}|}, \{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= \sum_{i \neq 1, |E_{NSHG}|} z^{|E_i|} + z^0. \\
 & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{V_{E_i}\}_{|E_i|=1}, \{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= \sum_{i \neq 1, |E_{NSHG}|, |E_i|=1} z^{|V_i|} + z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & V_{\frac{|E_{NSHG}|}{3}}^{EXTERNAL}, E_{\frac{|E_{NSHG}|}{3}}
 \end{aligned}$$

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$$\begin{aligned}
 & P : \\
 & E_1, V_1^{EXTERNAL},
 \end{aligned}$$



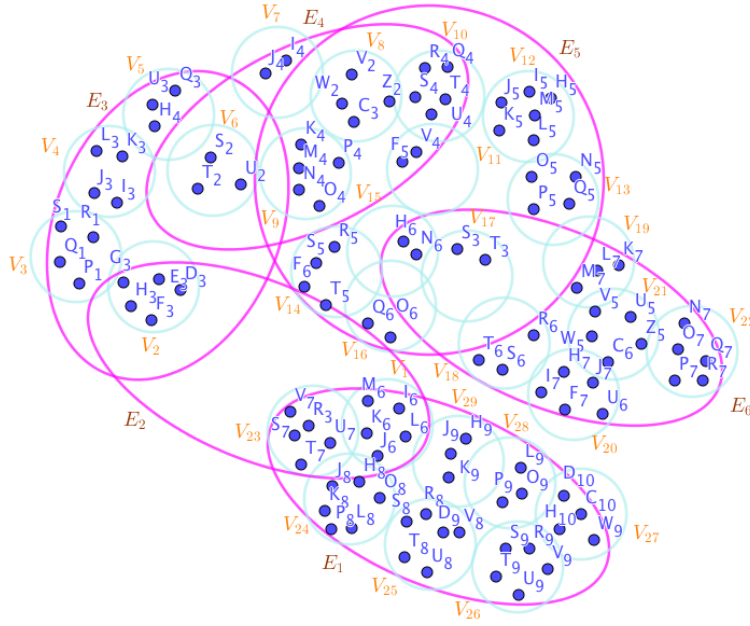


Figure 11.1: an Extreme SuperHyperPath Associated to the Notions of Extreme SuperHyperVertex-Decomposition in the Example (42.0.5)

136NSHG18

$$E_2, V_2^{EXTERNAL},$$

$$\dots,$$

$$E_{\lfloor \frac{|ESHG|}{3} \rfloor}, V_{\lfloor \frac{|ESHG|}{3} \rfloor}^{EXTERNAL}$$

be a longest path taken from a connected Extreme SuperHyperPath  $ESHP : (V, E)$ . There's a new way to redefine as

$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is straightforward. ■

136EXM18a

**Example 11.0.2.** In the Figure (31.1), the connected Extreme SuperHyperPath  $ESHP : (V, E)$ , is highlighted and featured. The Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.1), is the SuperHyperVertex-Decomposition.

**Proposition 11.0.3.** Assume a connected Extreme SuperHyperCycle  $ESHC : (V, E)$ . Then

$$\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}}$$

$$\begin{aligned}
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &V_{\frac{|E_{NSHG}|}{3}}^{EXTERNAL}, E_{\frac{|E_{NSHG}|}{3}}
 \end{aligned}$$

2107

$$\begin{aligned}
 &P : \\
 &E_1, V_1^{EXTERNAL}, \\
 &E_2, V_2^{EXTERNAL}, \\
 &\dots, \\
 &E_{\frac{|E_{NSHG}|}{3}}, V_{\frac{|E_{NSHG}|}{3}}^{EXTERNAL}
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperCycle  $ESHC : (V, E)$ . There's a 2108  
new way to redefine as 2109

$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded 2110  
to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is 2111  
straightforward. ■ 2112

136EXM19a

**Example 11.0.4.** In the Figure (31.2), the connected Extreme SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, in the Extreme 2113  
SuperHyperModel (31.2), is the Extreme SuperHyperVertex-Decomposition. 2114  
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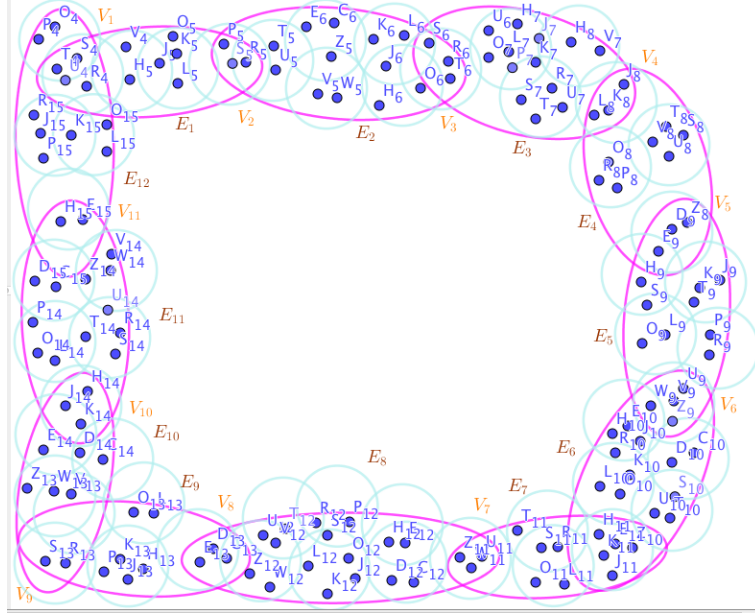


Figure 11.2: an Extreme SuperHyperCycle Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.7)

136NSHG19

**Proposition 11.0.5.** Assume a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{CENTER\}, \{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^{|CENTER|} + z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & CENTER, E_2
 \end{aligned}$$

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$$\begin{aligned}
 & P : \\
 & E_1, V_1^{EXTERNAL}, \\
 & E_2, CENTER
 \end{aligned}$$

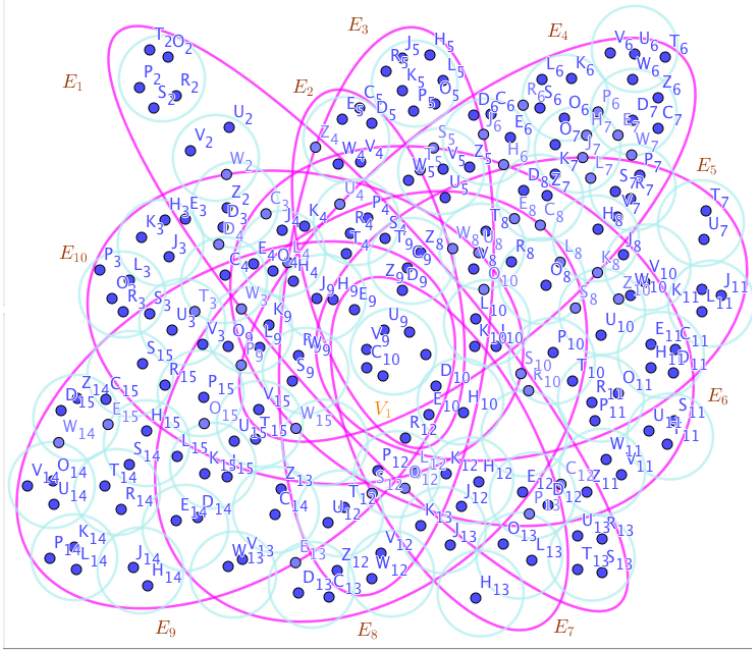


Figure 11.3: an Extreme SuperHyperStar Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.9)

136NSHG20a

be a longest path taken a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is straightforward. ■

136EXM20a

**Example 11.0.6.** In the Figure (31.3), the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , in the Extreme SuperHyperModel (31.3), is the Extreme SuperHyperVertex-Decomposition.

**Proposition 11.0.7.** Assume a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Then 2129

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{\text{EXTERNAL}}, E_1, \\
 & V_2^{\text{EXTERNAL}}, E_2, \\
 & \dots, \\
 & V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{\text{EXTERNAL}}, E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}.
 \end{aligned}$$

2131

$$\begin{aligned}
 & P : \\
 & E_1, V_1^{\text{EXTERNAL}}, \\
 & E_2, V_2^{\text{EXTERNAL}}, \\
 & \dots, \\
 & E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}, V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{\text{EXTERNAL}}
 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . There's 2132  
 a new way to redefine as 2133

$$\begin{aligned}
 & V_i^{\text{EXTERNAL}} \sim V_j^{\text{EXTERNAL}} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{\text{EXTERNAL}})| \geq |N(V_j)|$  where  $V_j$  is corresponded 2134  
 to  $V_i^{\text{EXTERNAL}}$  in the literatures of SuperHyperVertex-Decomposition. The latter is 2135  
 straightforward. Then there's no at least one SuperHyperVertex-Decomposition. Thus the notion 2136  
 of quasi may be up but the SuperHyperNotions based on SuperHyperVertex-Decomposition 2137  
 could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have 2138  
 one SuperHyperVertex as the representative in the 2139

$$\begin{aligned}
 & P : \\
 & V_1^{\text{EXTERNAL}}, E_1, \\
 & V_2^{\text{EXTERNAL}}, E_2
 \end{aligned}$$



$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Extreme } V\text{-Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{\text{Extreme } V\text{-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

*Proof.* Let

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$$\begin{aligned} & P : \\ & V_1^{\text{EXTERNAL}}, E_1, \\ & V_2^{\text{EXTERNAL}}, E_2, \\ & \dots, \\ & V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{\text{EXTERNAL}}, E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}. \end{aligned}$$

2152

$$\begin{aligned} & P : \\ & E_1, V_1^{\text{EXTERNAL}}, \\ & E_2, V_2^{\text{EXTERNAL}}, \\ & \dots, \\ & E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}, V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{\text{EXTERNAL}} \end{aligned}$$

is a longest SuperHyperVertex-Decomposition taken from a connected Extreme SuperHyper-  
 Multipartite  $ESHM : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned} & V_i^{\text{EXTERNAL}} \sim V_j^{\text{EXTERNAL}} \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}} \in E_z \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{\text{EXTERNAL}})| \geq |N(V_j)|$  where  $V_j$  is corresponded  
 to  $V_i^{\text{EXTERNAL}}$  in the literatures of SuperHyperVertex-Decomposition. The latter is  
 straightforward. Then there's no at least one SuperHyperVertex-Decomposition. Thus the notion  
 of quasi may be up but the SuperHyperNotions based on SuperHyperVertex-Decomposition  
 could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have  
 one SuperHyperVertex as the representative in the

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$$\begin{aligned} & P : \\ & V_1^{\text{EXTERNAL}}, E_1, \\ & V_2^{\text{EXTERNAL}}, E_2 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart  
 SuperHyperEdges are attained in any solution

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$$\begin{aligned} & P : \\ & V_1^{\text{EXTERNAL}}, E_1, \end{aligned}$$



136NSHG22a

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . 2164  
The latter is straightforward. 2165

**Example 11.0.10.** In the Figure (31.5), the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , in the Extreme SuperHyperModel (31.5), is the Extreme SuperHyperVertex-Decomposition.

$$\begin{aligned} & \mathcal{C}(NSHG)_{Extreme \text{ Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{Extreme \text{ Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \\ & \mathcal{C}(NSHG)_{Extreme \text{ V-Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{Extreme \text{ V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

*Proof.* Let

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1^*, \\ CENTER, E_2^* \end{aligned}$$

2173

$$\begin{aligned} P : \\ E_1^*, V_1^{EXTERNAL}, \\ E_2^*, CENTER \end{aligned}$$

is a longest SuperHyperVertex-Decomposition taken from a connected Extreme SuperHyper-  
 Wheel  $ESHW : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded  
 to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is  
 straightforward. Then there's at least one SuperHyperVertex-Decomposition. Thus the notion  
 of quasi isn't up and the SuperHyperNotions based on SuperHyperVertex-Decomposition  
 could be applied. The unique embedded SuperHyperVertex-Decomposition proposes some  
 longest SuperHyperVertex-Decomposition excerpt from some representatives. The latter is  
 straightforward. ■

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136EXM23a

**Example 11.0.12.** In the Extreme Figure (31.6), the connected Extreme SuperHyperWheel  
 $NSHW : (V, E)$ , is Extreme highlighted and featured. The obtained Extreme SuperHyperSet,  
 by the Algorithm in previous result, of the Extreme SuperHyperVertices of the connected  
 Extreme SuperHyperWheel  $ESHW : (V, E)$ , in the Extreme SuperHyperModel (31.6), is the  
 Extreme SuperHyperVertex-Decomposition.

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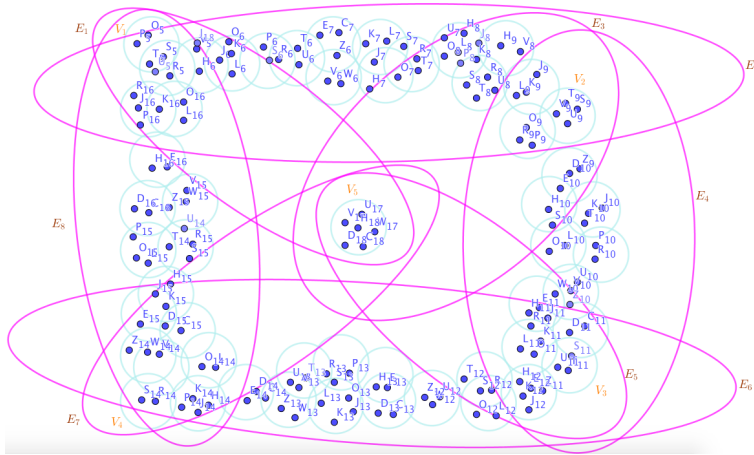


Figure 11.6: an Extreme SuperHyperWheel Extreme Associated to the Extreme Notions of Extreme SuperHyperVertex-Decomposition in the Extreme Example (42.0.15)

136NSHG23a



## The Surveys of Mathematical Sets On The Results But As The Initial Motivation

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For the SuperHyperVertex-Decomposition, Extreme SuperHyperVertex-Decomposition, and the  
Extreme SuperHyperVertex-Decomposition, some general results are introduced. 2191 2192

*Remark 12.0.1.* Let remind that the Extreme SuperHyperVertex-Decomposition is “redefined”  
on the positions of the alphabets. 2193 2194

**Corollary 12.0.2.** Assume Extreme SuperHyperVertex-Decomposition. Then 2195

$$\begin{aligned} & \text{Extreme SuperHyperVertex - Decomposition} = \\ & \{ \text{theSuperHyperVertex - Decomposition of the SuperHyperVertices} \mid \\ & \max | \text{SuperHyperOffensive} \\ & \text{SuperHyperVertex - Decomposition} \\ & | \text{Extremecardinality amid those SuperHyperVertex - Decomposition.} \} \end{aligned}$$

plus one Extreme SuperHyperNeighbor to one. Where  $\sigma_i$  is the unary operation on the  
SuperHyperVertices of the SuperHyperGraph to assign the determinacy, the indeterminacy  
and the neutrality, for  $i = 1, 2, 3$ , respectively. 2196 2197 2198

**Corollary 12.0.3.** Assume an Extreme SuperHyperGraph on the same identical letter of the  
alphabet. Then the notion of Extreme SuperHyperVertex-Decomposition and SuperHyperVertex-  
Decomposition coincide. 2199 2200 2201

**Corollary 12.0.4.** Assume an Extreme SuperHyperGraph on the same identical letter of  
the alphabet. Then a conseNeighborive sequence of the SuperHyperVertices is an Extreme  
SuperHyperVertex-Decomposition if and only if it's a SuperHyperVertex-Decomposition. 2202 2203 2204

**Corollary 12.0.5.** Assume an Extreme SuperHyperGraph on the same identical letter of  
the alphabet. Then a conseNeighborive sequence of the SuperHyperVertices is a strongest  
SuperHyperVertex-Decomposition if and only if it's a longest SuperHyperVertex-Decomposition. 2205 2206 2207

**Corollary 12.0.6.** Assume SuperHyperClasses of an Extreme SuperHyperGraph on the same  
identical letter of the alphabet. Then its Extreme SuperHyperVertex-Decomposition is its  
SuperHyperVertex-Decomposition and reversely. 2208 2209 2210

**Corollary 12.0.7.** Assume an Extreme SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel) on the same identical letter of the alphabet. Then its Extreme SuperHyperVertex-Decomposition is its SuperHyperVertex-Decomposition and reversely.

**Corollary 12.0.8.** Assume an Extreme SuperHyperGraph. Then its Extreme SuperHyperVertex-Decomposition isn't well-defined if and only if its SuperHyperVertex-Decomposition isn't well-defined.

**Corollary 12.0.9.** Assume SuperHyperClasses of an Extreme SuperHyperGraph. Then its Extreme SuperHyperVertex-Decomposition isn't well-defined if and only if its SuperHyperVertex-Decomposition isn't well-defined.

**Corollary 12.0.10.** Assume an Extreme SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). Then its Extreme SuperHyperVertex-Decomposition isn't well-defined if and only if its SuperHyperVertex-Decomposition isn't well-defined.

**Corollary 12.0.11.** Assume an Extreme SuperHyperGraph. Then its Extreme SuperHyperVertex-Decomposition is well-defined if and only if its SuperHyperVertex-Decomposition is well-defined.

**Corollary 12.0.12.** Assume SuperHyperClasses of an Extreme SuperHyperGraph. Then its Extreme SuperHyperVertex-Decomposition is well-defined if and only if its SuperHyperVertex-Decomposition is well-defined.

**Corollary 12.0.13.** Assume an Extreme SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). Then its Extreme SuperHyperVertex-Decomposition is well-defined if and only if its SuperHyperVertex-Decomposition is well-defined.

**Proposition 12.0.14.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph. Then  $V$  is

- (i) : the dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (ii) : the strong dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iii) : the connected dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iv) : the  $\delta$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (v) : the strong  $\delta$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (vi) : the connected  $\delta$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition.

**Proposition 12.0.15.** Let  $NTG : (V, E, \sigma, \mu)$  be an Extreme SuperHyperGraph. Then  $\emptyset$  is

- (i) : the SuperHyperDefensive SuperHyperVertex-Decomposition;
- (ii) : the strong SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iii) : the connected defensive SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iv) : the  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition;

(v) : the strong  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2246

(vi) : the connected  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 2247

**Proposition 12.0.16.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph. Then an independent SuperHyperSet is 2248  
2249

(i) : the SuperHyperDefensive SuperHyperVertex-Decomposition; 2250

(ii) : the strong SuperHyperDefensive SuperHyperVertex-Decomposition; 2251

(iii) : the connected SuperHyperDefensive SuperHyperVertex-Decomposition; 2252

(iv) : the  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2253

(v) : the strong  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2254

(vi) : the connected  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 2255

**Proposition 12.0.17.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperUniform SuperHyperGraph which is a SuperHyperVertex-Decomposition/SuperHyperPath. Then  $V$  is a maximal 2256  
2257

(i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 2258

(ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 2259

(iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 2260

(iv) :  $\mathcal{O}(ESHG)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2261

(v) : strong  $\mathcal{O}(ESHG)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2262

(vi) : connected  $\mathcal{O}(ESHG)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2263

Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 2264

**Proposition 12.0.18.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph which is a SuperHyperUniform SuperHyperWheel. Then  $V$  is a maximal 2265  
2266

(i) : dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2267

(ii) : strong dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2268

(iii) : connected dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2269

(iv) :  $\mathcal{O}(ESHG)$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2270

(v) : strong  $\mathcal{O}(ESHG)$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2271

(vi) : connected  $\mathcal{O}(ESHG)$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2272

Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 2273

**Proposition 12.0.19.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperUniform SuperHyperGraph which is a SuperHyperVertex-Decomposition/SuperHyperPath. Then the number of 2274  
2275



- (i) : the SuperHyperVertex-Decomposition; 2276
- (ii) : the SuperHyperVertex-Decomposition; 2277
- (iii) : the connected SuperHyperVertex-Decomposition; 2278
- (iv) : the  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 2279
- (v) : the strong  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 2280
- (vi) : the connected  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition. 2281
- is one and it's only  $V$ . Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 2282
- Proposition 12.0.20.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperUniform SuperHyperGraph which is a SuperHyperWheel. Then the number of 2284
- (i) : the dual SuperHyperVertex-Decomposition; 2286
- (ii) : the dual SuperHyperVertex-Decomposition; 2287
- (iii) : the dual connected SuperHyperVertex-Decomposition; 2288
- (iv) : the dual  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 2289
- (v) : the strong dual  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 2290
- (vi) : the connected dual  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition. 2291
- is one and it's only  $V$ . Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 2292
- Proposition 12.0.21.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperUniform SuperHyperGraph which is a SuperHyperStar/SuperHyperComplete SuperHyperBipartite/SuperHyperComplete SuperHyperMultipartite. Then a SuperHyperSet contains [the SuperHyperCenter and] the half of multiplying  $r$  with the number of all the SuperHyperEdges plus one of all the SuperHyperVertices is a 2294
- (i) : dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2299
- (ii) : strong dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2300
- (iii) : connected dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2301
- (iv) :  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2302
- (v) : strong  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2303
- (vi) : connected  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition. 2304

**Proposition 12.0.22.** *Let  $ESHG : (V, E)$  be an Extreme SuperHyperUniform SuperHyperGraph which is a SuperHyperStar/SuperHyperComplete SuperHyperBipartite/SuperHyperComplete SuperHyperMultipartite. Then a SuperHyperSet contains the half of multiplying  $r$  with the number of all the SuperHyperEdges plus one of all the SuperHyperVertices in the biggest SuperHyperPart is a*

- (i) : SuperHyperDefensive SuperHyperVertex-Decomposition;
- (ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iv) :  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition;
- (v) : strong  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition;
- (vi) : connected  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition.

**Proposition 12.0.23.** *Let  $ESHG : (V, E)$  be an Extreme SuperHyperUniform SuperHyperGraph which is a SuperHyperStar/SuperHyperComplete SuperHyperBipartite/SuperHyperComplete SuperHyperMultipartite. Then Then the number of*

- (i) : dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (ii) : strong dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iii) : connected dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iv) :  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (v) : strong  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (vi) : connected  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition.

*is one and it's only  $S$ , a SuperHyperSet contains [the SuperHyperCenter and] the half of multiplying  $r$  with the number of all the SuperHyperEdges plus one of all the SuperHyperVertices. Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide.*

**Proposition 12.0.24.** *Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph. The number of connected component is  $|V - S|$  if there's a SuperHyperSet which is a dual*

- (i) : SuperHyperDefensive SuperHyperVertex-Decomposition;
- (ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iv) : SuperHyperVertex-Decomposition;
- (v) : strong 1-SuperHyperDefensive SuperHyperVertex-Decomposition;
- (vi) : connected 1-SuperHyperDefensive SuperHyperVertex-Decomposition.

**Proposition 12.0.25.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph. Then the number is at most  $\mathcal{O}(ESHG)$  and the Extreme number is at most  $\mathcal{O}_n(ESHG)$ . 2336  
2337

**Proposition 12.0.26.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph which is SuperHyperComplete. The number is  $\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1$  and the Extreme number is  $\min \sum_{v \in \{v_1, v_2, \dots, v_t\}} \frac{\mathcal{O}(ESHG:(V,E))}{2} \subseteq V \sigma(v)$ , in the setting of dual 2338  
2339  
2340

(i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 2341

(ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 2342

(iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 2343

(iv) :  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2344

(v) : strong  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2345

(vi) : connected  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 2346

**Proposition 12.0.27.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph which is  $\emptyset$ . The number is 0 and the Extreme number is 0, for an independent SuperHyperSet in the setting of dual 2347  
2348  
2349

(i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 2350

(ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 2351

(iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 2352

(iv) : 0-SuperHyperDefensive SuperHyperVertex-Decomposition; 2353

(v) : strong 0-SuperHyperDefensive SuperHyperVertex-Decomposition; 2354

(vi) : connected 0-SuperHyperDefensive SuperHyperVertex-Decomposition. 2355

**Proposition 12.0.28.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph which is SuperHyperComplete. Then there's no independent SuperHyperSet. 2356  
2357

**Proposition 12.0.29.** Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph which is SuperHyperVertex-Decomposition/SuperHyperPath/SuperHyperWheel. The number is  $\mathcal{O}(ESHG : (V, E))$  and the Extreme number is  $\mathcal{O}_n(ESHG : (V, E))$ , in the setting of a dual 2358  
2359  
2360  
2361

(i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 2362

(ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 2363

(iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 2364

(iv) :  $\mathcal{O}(ESHG : (V, E))$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2365

(v) : strong  $\mathcal{O}(ESHG : (V, E))$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2366

(vi) : *connected  $\mathcal{O}(ESHG : (V, E))$ -SuperHyperDefensive SuperHyperVertex-Decomposition.* 2367

**Proposition 12.0.30.** *Let  $ESHG : (V, E)$  be an Extreme SuperHyperGraph which is Super-HyperStar/complete SuperHyperBipartite/complete SuperHyperMultiPartite. The number is  $\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1$  and the Extreme number is  $\min \Sigma_{v \in \{v_1, v_2, \dots, v_t\}_{t > \frac{\mathcal{O}(ESHG:(V,E))}{2}}} \subseteq V \sigma(v)$ , in the setting of a dual* 2368  
2369  
2370  
2371

(i) : *SuperHyperDefensive SuperHyperVertex-Decomposition;* 2372

(ii) : *strong SuperHyperDefensive SuperHyperVertex-Decomposition;* 2373

(iii) : *connected SuperHyperDefensive SuperHyperVertex-Decomposition;* 2374

(iv) :  *$(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition;* 2375

(v) : *strong  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition;* 2376

(vi) : *connected  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition.* 2377

**Proposition 12.0.31.** *Let  $\mathcal{NSHF} : (V, E)$  be a SuperHyperFamily of the  $ESHGs : (V, E)$  Extreme SuperHyperGraphs which are from one-type SuperHyperClass which the result is obtained for the individuals. Then the results also hold for the SuperHyperFamily  $\mathcal{NSHF} : (V, E)$  of these specific SuperHyperClasses of the Extreme SuperHyperGraphs.* 2378  
2379  
2380  
2381

**Proposition 12.0.32.** *Let  $ESHG : (V, E)$  be a strong Extreme SuperHyperGraph. If  $S$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition, then  $\forall v \in V \setminus S, \exists x \in S$  such that* 2382  
2383

(i)  $v \in N_s(x)$ ; 2384

(ii)  $vx \in E$ . 2385

**Proposition 12.0.33.** *Let  $ESHG : (V, E)$  be a strong Extreme SuperHyperGraph. If  $S$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition, then* 2386  
2387

(i)  $S$  is SuperHyperVertex-Decomposition set; 2388

(ii) there's  $S \subseteq S'$  such that  $|S'|$  is SuperHyperChromatic number. 2389

**Proposition 12.0.34.** *Let  $ESHG : (V, E)$  be a strong Extreme SuperHyperGraph. Then* 2390

(i)  $\Gamma \leq \mathcal{O}$ ; 2391

(ii)  $\Gamma_s \leq \mathcal{O}_n$ . 2392

**Proposition 12.0.35.** *Let  $ESHG : (V, E)$  be a strong Extreme SuperHyperGraph which is connected. Then* 2393  
2394

(i)  $\Gamma \leq \mathcal{O} - 1$ ; 2395

(ii)  $\Gamma_s \leq \mathcal{O}_n - \Sigma_{i=1}^3 \sigma_i(x)$ . 2396

**Proposition 12.0.36.** *Let  $ESHG : (V, E)$  be an odd SuperHyperPath. Then* 2397

- (i) the SuperHyperSet  $S = \{v_2, v_4, \dots, v_{n-1}\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2398  
 2399
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$  and corresponded SuperHyperSet is  $S = \{v_2, v_4, \dots, v_{n-1}\}$ ; 2400
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s)\}$ ; 2401
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_{n-1}\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only a dual SuperHyperVertex-Decomposition. 2402  
 2403
- Proposition 12.0.37.** Let  $ESHG : (V, E)$  be an even SuperHyperPath. Then 2404
- (i) the set  $S = \{v_2, v_4, \dots, v_n\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2405  
 2406
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$  and corresponded SuperHyperSets are  $\{v_2, v_4, \dots, v_n\}$  and  $\{v_1, v_3, \dots, v_{n-1}\}$ ; 2407
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_n\}} \sum_{i=1}^3 \sigma_i(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s)\}$ ; 2408
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_n\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only dual SuperHyperVertex-Decomposition. 2409  
 2410
- Proposition 12.0.38.** Let  $ESHG : (V, E)$  be an even SuperHyperVertex-Decomposition. Then 2411
- (i) the SuperHyperSet  $S = \{v_2, v_4, \dots, v_n\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2412  
 2413
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$  and corresponded SuperHyperSets are  $\{v_2, v_4, \dots, v_n\}$  and  $\{v_1, v_3, \dots, v_{n-1}\}$ ; 2414
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_n\}} \sigma(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sigma(s)\}$ ; 2415
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_n\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only dual SuperHyperVertex-Decomposition. 2416  
 2417
- Proposition 12.0.39.** Let  $ESHG : (V, E)$  be an odd SuperHyperVertex-Decomposition. Then 2418
- (i) the SuperHyperSet  $S = \{v_2, v_4, \dots, v_{n-1}\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2419  
 2420
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$  and corresponded SuperHyperSet is  $S = \{v_2, v_4, \dots, v_{n-1}\}$ ; 2421
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s)\}$ ; 2422
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_{n-1}\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only dual SuperHyperVertex-Decomposition. 2423  
 2424
- Proposition 12.0.40.** Let  $ESHG : (V, E)$  be SuperHyperStar. Then 2425
- (i) the SuperHyperSet  $S = \{c\}$  is a dual maximal SuperHyperVertex-Decomposition; 2426
- (ii)  $\Gamma = 1$ ; 2427
- (iii)  $\Gamma_s = \sum_{i=1}^3 \sigma_i(c)$ ; 2428

(iv) the SuperHyperSets  $S = \{c\}$  and  $S \subset S'$  are only dual SuperHyperVertex-Decomposition. 2429

**Proposition 12.0.41.** Let  $ESHG : (V, E)$  be SuperHyperWheel. Then 2430

(i) the SuperHyperSet  $S = \{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}$  is a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition; 2431  
2432

(ii)  $\Gamma = |\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}|$ ; 2433

(iii)  $\Gamma_s = \sum_{\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}} \sum_{i=1}^3 \sigma_i(s)$ ; 2434

(iv) the SuperHyperSet  $\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}$  is only a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition. 2435  
2436

**Proposition 12.0.42.** Let  $ESHG : (V, E)$  be an odd SuperHyperComplete. Then 2437

(i) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2438  
2439

(ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$ ; 2440

(iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}}$ ; 2441

(iv) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  is only a dual SuperHyperDefensive SuperHyperVertex-Decomposition. 2442  
2443

**Proposition 12.0.43.** Let  $ESHG : (V, E)$  be an even SuperHyperComplete. Then 2444

(i) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 2445  
2446

(ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$ ; 2447

(iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}}$ ; 2448

(iv) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  is only a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition. 2449  
2450

**Proposition 12.0.44.** Let  $\mathcal{NSHF} : (V, E)$  be a  $m$ -SuperHyperFamily of Extreme SuperHyperStars with common Extreme SuperHyperVertex SuperHyperSet. Then 2451  
2452

(i) the SuperHyperSet  $S = \{c_1, c_2, \cdots, c_m\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition for  $\mathcal{NSHF}$ ; 2453  
2454

(ii)  $\Gamma = m$  for  $\mathcal{NSHF} : (V, E)$ ; 2455

(iii)  $\Gamma_s = \sum_{i=1}^m \sum_{j=1}^3 \sigma_j(c_i)$  for  $\mathcal{NSHF} : (V, E)$ ; 2456

(iv) the SuperHyperSets  $S = \{c_1, c_2, \cdots, c_m\}$  and  $S \subset S'$  are only dual SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ . 2457  
2458

**Proposition 12.0.45.** *Let  $\mathcal{NSHF} : (V, E)$  be an  $m$ -SuperHyperFamily of odd SuperHyperComplete SuperHyperGraphs with common Extreme SuperHyperVertex SuperHyperSet. Then* 2459 2460

- (i) *the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  is a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition for  $\mathcal{NSHF}$ ;* 2461 2462
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$  *for  $\mathcal{NSHF} : (V, E)$ ;* 2463
- (iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}}$  *for  $\mathcal{NSHF} : (V, E)$ ;* 2464
- (iv) *the SuperHyperSets  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  are only a dual maximal SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ .* 2465 2466

**Proposition 12.0.46.** *Let  $\mathcal{NSHF} : (V, E)$  be a  $m$ -SuperHyperFamily of even SuperHyperComplete SuperHyperGraphs with common Extreme SuperHyperVertex SuperHyperSet. Then* 2467 2468

- (i) *the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ ;* 2469 2470
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$  *for  $\mathcal{NSHF} : (V, E)$ ;* 2471
- (iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}}$  *for  $\mathcal{NSHF} : (V, E)$ ;* 2472
- (iv) *the SuperHyperSets  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  are only dual maximal SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ .* 2473 2474

**Proposition 12.0.47.** *Let  $ESHG : (V, E)$  be a strong Extreme SuperHyperGraph. Then* 2475 2476  
*following statements hold;*

- (i) *if  $s \geq t$  and a SuperHyperSet  $S$  of SuperHyperVertices is an  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is an  $s$ -SuperHyperDefensive SuperHyperVertex-Decomposition;* 2477 2478 2479
- (ii) *if  $s \leq t$  and a SuperHyperSet  $S$  of SuperHyperVertices is a dual  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is a dual  $s$ -SuperHyperDefensive SuperHyperVertex-Decomposition.* 2480 2481 2482

**Proposition 12.0.48.** *Let  $ESHG : (V, E)$  be a strong Extreme SuperHyperGraph. Then* 2483 2484  
*following statements hold;*

- (i) *if  $s \geq t + 2$  and a SuperHyperSet  $S$  of SuperHyperVertices is an  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is an  $s$ -SuperHyperPowerful SuperHyperVertex-Decomposition;* 2485 2486 2487
- (ii) *if  $s \leq t$  and a SuperHyperSet  $S$  of SuperHyperVertices is a dual  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is a dual  $s$ -SuperHyperPowerful SuperHyperVertex-Decomposition.* 2488 2489 2490

**Proposition 12.0.49.** *Let  $ESHG : (V, E)$  be a  $a[an]$   $[V-]$ SuperHyperUniform-strong-Extreme SuperHyperGraph. Then following statements hold;* 2491 2492



- (i) if  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{r}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2493  
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- (ii) if  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{r}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2495  
2496
- (iii) if  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is an V-SuperHyperDefensive SuperHyperVertex-Decomposition; 2497  
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- (iv) if  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is a dual V-SuperHyperDefensive SuperHyperVertex-Decomposition. 2499  
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- Proposition 12.0.50.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Extreme SuperHyperGraph. Then following statements hold; 2501  
2502
- (i)  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{r}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2503  
2504
- (ii)  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{r}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2505  
2506
- (iii)  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is an V-SuperHyperDefensive SuperHyperVertex-Decomposition; 2507  
2508
- (iv)  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is a dual V-SuperHyperDefensive SuperHyperVertex-Decomposition. 2509  
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- Proposition 12.0.51.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Extreme SuperHyperGraph which is a SuperHyperComplete. Then following statements hold; 2511  
2512
- (i)  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2513  
2514
- (ii)  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2515  
2516
- (iii)  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is an  $(\mathcal{O} - 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2517  
2518
- (iv)  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is a dual  $(\mathcal{O} - 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 2519  
2520
- Proposition 12.0.52.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Extreme SuperHyperGraph which is a SuperHyperComplete. Then following statements hold; 2521  
2522
- (i) if  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2523  
2524
- (ii) if  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 2525  
2526
- (iii) if  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is  $(\mathcal{O} - 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 2527  
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(iv) if  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is a dual  $(\mathcal{O} - 1)$ -  
*SuperHyperDefensive SuperHyperVertex-Decomposition.* 2529 2530

**Proposition 12.0.53.** Let  $ESHG : (V, E)$  is a  $a[an]$   $[V-]$ SuperHyperUniform-strong-Extreme  
 SuperHyperGraph which is SuperHyperVertex-Decomposition. Then following statements hold; 2531 2532

(i)  $\forall a \in S, |N_s(a) \cap S| < 2$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-  
 Decomposition; 2533 2534

(ii)  $\forall a \in V \setminus S, |N_s(a) \cap S| > 2$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
 SuperHyperVertex-Decomposition; 2535 2536

(iii)  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive  
 SuperHyperVertex-Decomposition; 2537 2538

(iv)  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
 SuperHyperVertex-Decomposition. 2539 2540

**Proposition 12.0.54.** Let  $ESHG : (V, E)$  is a  $a[an]$   $[V-]$ SuperHyperUniform-strong-Extreme  
 SuperHyperGraph which is SuperHyperVertex-Decomposition. Then following statements hold; 2541 2542

(i) if  $\forall a \in S, |N_s(a) \cap S| < 2$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive  
 SuperHyperVertex-Decomposition; 2543 2544

(ii) if  $\forall a \in V \setminus S, |N_s(a) \cap S| > 2$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
 SuperHyperVertex-Decomposition; 2545 2546

(iii) if  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive  
 SuperHyperVertex-Decomposition; 2547 2548

(iv) if  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
 SuperHyperVertex-Decomposition. 2549 2550

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## Extreme Applications in Cancer's Extreme Recognition

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The cancer is the Extreme disease but the Extreme model is going to figure out what's going on this Extreme phenomenon. The special Extreme case of this Extreme disease is considered and as the consequences of the model, some parameters are used. The cells are under attack of this disease but the moves of the cancer in the special region are the matter of mind. The Extreme recognition of the cancer could help to find some Extreme treatments for this Extreme disease. In the following, some Extreme steps are Extreme devised on this disease.

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**Step 1. (Extreme Definition)** The Extreme recognition of the cancer in the long-term Extreme function.

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**Step 2. (Extreme Issue)** The specific region has been assigned by the Extreme model [it's called Extreme SuperHyperGraph] and the long Extreme cycle of the move from the cancer is identified by this research. Sometimes the move of the cancer hasn't be easily identified since there are some determinacy, indeterminacy and neutrality about the moves and the effects of the cancer on that region; this event leads us to choose another model [it's said to be Extreme SuperHyperGraph] to have convenient perception on what's happened and what's done.

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**Step 3. (Extreme Model)** There are some specific Extreme models, which are well-known and they've got the names, and some general Extreme models. The moves and the Extreme traces of the cancer on the complex tracks and between complicated groups of cells could be fantasized by an Extreme SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the Extreme SuperHyperVertex-Decomposition or the Extreme SuperHyperVertex-Decomposition in those Extreme Extreme SuperHyperModels.

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## Case 1: The Initial Extreme Steps Toward Extreme SuperHyperBipartite as Extreme SuperHyperModel

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**Step 4. (Extreme Solution)** In the Extreme Figure (34.1), the Extreme SuperHyperBipartite is Extreme highlighted and Extreme featured.

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By using the Extreme Figure (34.1) and the Table (34.1), the Extreme SuperHyperBipartite is obtained.

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The obtained Extreme SuperHyperSet, by the Extreme Algorithm in previous Extreme

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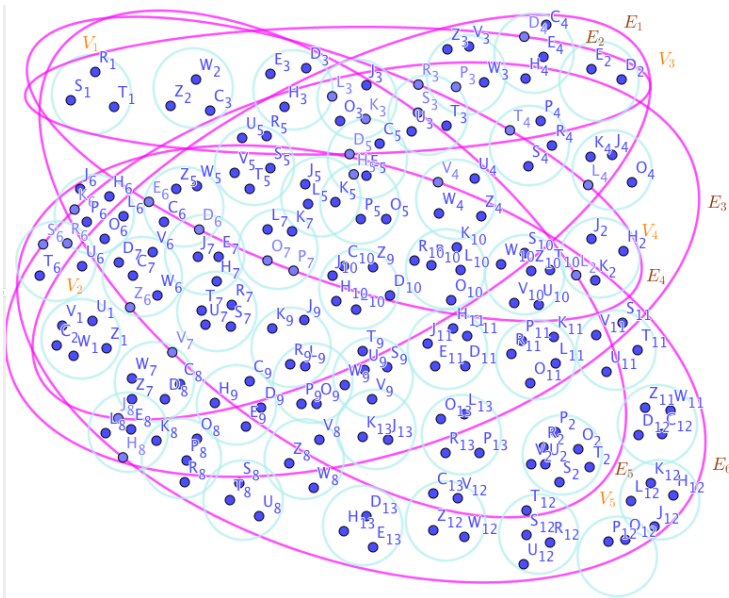


Table 14.1: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges  
Belong to The Extreme SuperHyperBipartite

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

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result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperBi- 2585  
partite  $ESHB : (V, E)$ , in the Extreme SuperHyperModel (34.1), is the Extreme 2586  
SuperHyperVertex-Decomposition. 2587

## Case 2: The Increasing Extreme Steps Toward Extreme SuperHyperMultipartite as Extreme SuperHyperModel

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**Step 4. (Extreme Solution)** In the Extreme Figure (35.1), the Extreme SuperHyperMultipartite is Extreme highlighted and Extreme featured.

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By using the Extreme Figure (35.1) and the Table (35.1), the Extreme SuperHyperMultipartite is obtained.

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The obtained Extreme SuperHyperSet, by the Extreme Algorithm in previous res-

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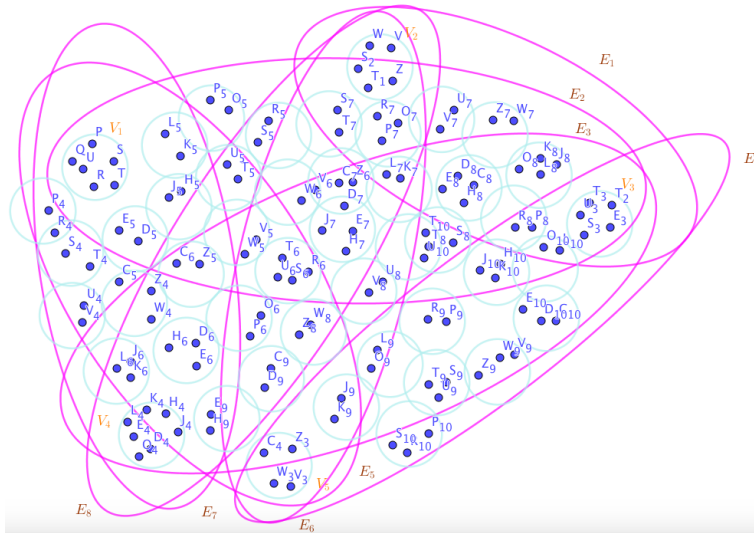


Figure 15.1: an Extreme SuperHyperMultipartite Associated to the Notions of Extreme SuperHyperVertex-Decomposition

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Table 15.1: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges  
Belong to The Extreme SuperHyperMultipartite

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

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ult, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperMul- 2598  
tipartite  $ESHM : (V, E)$ , in the Extreme SuperHyperModel (35.1), is the Extreme 2599  
SuperHyperVertex-Decomposition. 2600

## Wondering Open Problems But As The Directions To Forming The Motivations

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In what follows, some “problems” and some “questions” are proposed. 2604  
The SuperHyperVertex-Decomposition and the Extreme SuperHyperVertex-Decomposition are 2605  
defined on a real-world application, titled “Cancer’s Recognitions”. 2606

**Question 16.0.1.** Which the else SuperHyperModels could be defined based on Cancer’s 2607  
recognitions? 2608

**Question 16.0.2.** Are there some SuperHyperNotions related to SuperHyperVertex- 2609  
Decomposition and the Extreme SuperHyperVertex-Decomposition? 2610

**Question 16.0.3.** Are there some Algorithms to be defined on the SuperHyperModels to compute 2611  
them? 2612

**Question 16.0.4.** Which the SuperHyperNotions are related to beyond the SuperHyperVertex- 2613  
Decomposition and the Extreme SuperHyperVertex-Decomposition? 2614

**Problem 16.0.5.** The SuperHyperVertex-Decomposition and the Extreme SuperHyperVertex- 2615  
Decomposition do a SuperHyperModel for the Cancer’s recognitions and they’re based on 2616  
SuperHyperVertex-Decomposition, are there else? 2617

**Problem 16.0.6.** Which the fundamental SuperHyperNumbers are related to these SuperHyper- 2618  
Numbers types-results? 2619

**Problem 16.0.7.** What’s the independent research based on Cancer’s recognitions concerning 2620  
the multiple types of SuperHyperNotions? 2621



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## Conclusion and Closing Remarks

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In this section, concluding remarks and closing remarks are represented. The drawbacks of this research are illustrated. Some benefits and some advantages of this research are highlighted. This research uses some approaches to make Extreme SuperHyperGraphs more understandable. In this endeavor, two SuperHyperNotions are defined on the SuperHyperVertex-Decomposition. For that sake in the second definition, the main definition of the Extreme SuperHyperGraph is redefined on the position of the alphabets. Based on the new definition for the Extreme SuperHyperGraph, the new SuperHyperNotion, Extreme SuperHyperVertex-Decomposition, finds the convenient background to implement some results based on that. Some SuperHyperClasses and some Extreme SuperHyperClasses are the cases of this research on the modeling of the regions where are under the attacks of the cancer to recognize this disease as it's mentioned on the title "Cancer's Recognitions". To formalize the instances on the SuperHyperNotion, SuperHyperVertex-Decomposition, the new SuperHyperClasses and SuperHyperClasses, are introduced. Some general results are gathered in the section on the SuperHyperVertex-Decomposition and the Extreme SuperHyperVertex-Decomposition. The clarifications, instances and literature reviews have taken the whole way through. In this research, the literature reviews have fulfilled the lines containing the notions and the results. The SuperHyperGraph and Extreme SuperHyperGraph are the SuperHyperModels on the "Cancer's Recognitions" and both bases are the background of this research. Sometimes the cancer has been happened on the region, full of cells, groups of cells and embedded styles. In this segment, the SuperHyperModel proposes some SuperHyperNotions based on the connectivities of the moves of the cancer in the longest and strongest styles with the formation of the design and the architecture are formally called " SuperHyperVertex-Decomposition" in the themes of jargons and buzzwords. The prefix "SuperHyper" refers to the theme of the embedded styles to figure out the background for the SuperHyperNotions. In the Table (37.1), benefits and avenues for this research are, figured out, pointed out and spoken out.

Table 17.1: An Overlook On This Research And Beyond

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Advantages	Limitations
1. Redefining Extreme SuperHyperGraph	1. General Results
2. SuperHyperVertex-Decomposition	
3. Extreme SuperHyperVertex-Decomposition	2. Other SuperHyperNumbers
4. Modeling of Cancer’s Recognitions	
5. SuperHyperClasses	3. SuperHyperFamilies

# Extreme SuperHyperDuality But As The Extensions Excerpt From Dense And Super Forms

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**Definition 18.0.1.** (Different Extreme Types of Extreme SuperHyperDuality). 2653

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called 2654

- (i) **Extreme e-SuperHyperDuality** if  $\forall E_i \in E', \exists E_j \in E_{ESHG:(V,E)} \setminus E'$  such that  $V_a \in E_i, E_j$ ; 2656
- (ii) **Extreme re-SuperHyperDuality** if  $\forall E_i \in E', \exists E_j \in E_{ESHG:(V,E)} \setminus E'$  such that  $V_a \in E_i, E_j$  and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 2658
- (iii) **Extreme v-SuperHyperDuality** if  $\forall V_i \in V', \exists V_j \in V_{ESHG:(V,E)} \setminus V'$  such that  $V_i, V_j \in E_a$ ; 2660
- (iv) **Extreme rv-SuperHyperDuality** if  $\forall V_i \in V', \exists V_j \in V_{ESHG:(V,E)} \setminus V'$  such that  $V_i, V_j \in E_a$  and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 2662
- (v) **Extreme SuperHyperDuality** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality. 2664

**Definition 18.0.2.** ((Extreme) SuperHyperDuality). 2667

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 2668

- (i) an **Extreme SuperHyperDuality** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; 2670

- (ii) a **Extreme SuperHyperDuality** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for a Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; 2677  
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- (iii) an **Extreme SuperHyperDuality SuperHyperPolynomial** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; and the Extreme power is corresponded to its Extreme coefficient; 2683  
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- (iv) a **Extreme SuperHyperDuality SuperHyperPolynomial** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; and the Extreme power is corresponded to its Extreme coefficient; 2692  
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- (v) an **Extreme R-SuperHyperDuality** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; 2701  
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- (vi) a **Extreme R-SuperHyperDuality** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; 2708  
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- (vii) an **Extreme R-SuperHyperDuality SuperHyperPolynomial** if it's either of Extreme e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme 2714  
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cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVer- 2720  
tices such that they form the Extreme SuperHyperDuality; and the Extreme power is 2721  
corresponded to its Extreme coefficient; 2722

(viii) a **Extreme SuperHyperDuality SuperHyperPolynomial** if it's either of Extreme 2723  
e-SuperHyperDuality, Extreme re-SuperHyperDuality, Extreme v-SuperHyperDuality, 2724  
and Extreme rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph 2725  
 $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients 2726  
defined as the Extreme number of the maximum Extreme cardinality of the Extreme 2727  
SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality 2728  
conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such 2729  
that they form the Extreme SuperHyperDuality; and the Extreme power is corresponded 2730  
to its Extreme coefficient. 2731

**Example 18.0.3.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in the 2732  
mentioned Extreme Figures in every Extreme items. 2733

- On the Figure (30.1), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDu- 2734  
ality, is up. The Extreme Algorithm is Extremely straightforward.  $E_1$  and  $E_3$  are some 2735  
empty Extreme SuperHyperEdges but  $E_2$  is a loop Extreme SuperHyperEdge and  $E_4$  is 2736  
an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's 2737  
only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is 2738  
Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme 2739  
endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme 2740  
SuperHyperDuality. 2741

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.2), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 2742  
Duality, is up. The Extreme Algorithm is Extremely straightforward.  $E_1, E_2$  and  $E_3$  2743  
are some empty Extreme SuperHyperEdges but  $E_4$  is an Extreme SuperHyperEdge. 2744  
Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHy- 2745  
perEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that 2746  
there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme 2747  
SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperDuality. 2748

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 3z.\end{aligned}$$



- On the Figure (30.3), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2749  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2751  
2752

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_4, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2753  
2754

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2755  
2756

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_{3i+1_{i=0}^3}, E_{3i+24_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 6z^8. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_{3i+1_{i=0}^7}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 6z^8.\end{aligned}$$

- On the Figure (30.7), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2757  
2758

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_{15}, E_{16}, E_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.8), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2759  
2760

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} = \{E_4\}.$$

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.9), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2761  
2762

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_{3i+1^3_{i=0}}, E_{23}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 3z^5. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_{3i+1^3_{i=0}}, V_{15}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 3z^5.\end{aligned}$$

- On the Figure (30.10), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2763  
2764

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.11), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2765  
2766

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_1, E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_6, V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.12), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2767  
2768

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1, V_{i \neq 5, 7, 8}^{10}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 5z^5.\end{aligned}$$

- On the Figure (30.13), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2769  
2770

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_5, E_9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.14), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2771  
2772

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.15), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2773  
2774

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.16), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2775  
2776

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ (2 \times 1 \times 2) + (2 \times 4 \times 5)z.\end{aligned}$$

- On the Figure (30.17), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2777  
2778

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2)z.\end{aligned}$$

- On the Figure (30.18), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2779  
2780

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ (2 \times 2 \times 2)z.\end{aligned}$$

- On the Figure (30.19), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2781  
2782

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_{3i+1_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 3z^4. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_{2i+1_{i=0}^5}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 2z^6.\end{aligned}$$

- On the Figure (30.20), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2783  
2784

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2785  
2786

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Extreme SuperHyperNotion, namely, Extreme SuperHyperDuality, is up. The Extreme Algorithm is Extremely straightforward. 2787  
2788

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality}} &= \{E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperDuality SuperHyperPolynomial}} &= 4z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality}} &= \{V_3, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperDuality SuperHyperPolynomial}} &= \\ = 10 \times 9 + 10 \times 6 + 12 \times 9 + 12 \times 6z^2.\end{aligned}$$

The previous Extreme approach apply on the upcoming Extreme results on Extreme SuperHyperClasses. 2789  
2790

**Proposition 18.0.4.** Assume a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . Then

2791

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperDuality} = \\
 & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperDuality SuperHyperPolynomial} \\
 & = 3z^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e R-SuperHyperDuality} \\
 & = \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e R-SuperHyperDuality SuperHyperPolynomial} \\
 & = \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Extrem e Cardinality} z^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}.
 \end{aligned}$$

*Proof.* Let

2792

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}^{EXTERNAL}.
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . There's a new way to redefine as

2793

2794

$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. ■

2795

2796

136EXM18a

**Example 18.0.5.** In the Figure (31.1), the connected Extreme SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.1), is the SuperHyperDuality.

2797

2798

2799

**Proposition 18.0.6.** Assume a connected Extreme SuperHyperCycle  $ESH C : (V, E)$ . Then

2800

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperDuality} = \\
 & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperDuality SuperHyperPolynomial} \\
 & = 3z^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e R-SuperHyperDuality}
 \end{aligned}$$

$$\begin{aligned}
 &= \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}. \\
 &\mathcal{C}(NSHG)_{Extreme R-SuperHyperDuality SuperHyperPolynomial} \\
 &= \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Extreme Cardinality} \approx \frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}.
 \end{aligned}$$

*Proof.* Let

2801

$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}^{EXTERNAL}.
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperCycle  $ESHG : (V, E)$ . There's a new way to redefine as

2803

$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. ■

2805

136EXM19a

**Example 18.0.7.** In the Figure (31.2), the connected Extreme SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.2), is the Extreme SuperHyperDuality.

2808

**Proposition 18.0.8.** Assume a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . Then

2809

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{Extreme Quasi-SuperHyperDuality} = \{E \in E_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Extreme Quasi-SuperHyperDuality SuperHyperPolynomial} \\
 &= |i \mid E_i \in E_{ESHG:(V,E)}|_{Extreme Cardinality}|z. \\
 &\mathcal{C}(NSHG)_{Extreme R-Quasi-SuperHyperDuality} = \{CENTER \in V_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Extreme R-Quasi-SuperHyperDuality SuperHyperPolynomial} = z.
 \end{aligned}$$

*Proof.* Let

2810

$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

be a longest path taken a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

2812

$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. ■

2814

**Example 18.0.9.** In the Figure (31.3), the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , in the Extreme SuperHyperModel (31.3), is the Extreme SuperHyperDuality.

**Proposition 18.0.10.** Assume a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Then

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperDuality}} \\
 &= \{E_i \in E_{P_i^{ESHG:(V,E)}}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperDuality SuperHyperPolynomial}} \\
 &= \left( \sum_{i=|P^{ESHG:(V,E)}|}^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose } |P_i^{ESHG:(V,E)}| \right) \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperDuality}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperDuality SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Extreme Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) = z^2.
 \end{aligned}$$

*Proof.* Let

2820

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . There's a new way to redefine as

2822

$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. Then there's at least one SuperHyperDuality. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperDuality could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

2828

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1,
 \end{aligned}$$

$$V_2^{EXTERNAL}, E_2,$$

$$\dots,$$

$$E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}$$

is a longest SuperHyperDuality taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$P :$$

$$V_1^{EXTERNAL}, E_1,$$

$$V_2^{EXTERNAL}, E_2,$$

$$\dots,$$

$$E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}$$

The latter is straightforward. ■ 2832

**Example 18.0.11.** In the Extreme Figure (31.4), the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , is Extreme highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Extreme Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , in the Extreme SuperHyperModel (31.4), is the Extreme SuperHyperDuality.

**Proposition 18.0.12.** Assume a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Then

$$\begin{aligned} & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperDuality}} \\ &= \{E_i \in E_{P_i^{ESHG:(V,E)}}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)}| \in P^{ESHG:(V,E)}\}. \\ & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperDuality SuperHyperPolynomial}} \\ &= \left( \sum_{i=|P^{ESHG:(V,E)}|}^{\min_i |P_i^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)}| \in P^{ESHG:(V,E)}) \text{choose} |P_i^{ESHG:(V,E)}| \right) \\ & \quad z^{\min_i |P_i^{ESHG:(V,E)}| \in P^{ESHG:(V,E)}} \\ & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperDuality}} \\ &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, i \neq j\}. \\ & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperDuality SuperHyperPolynomial}} \\ &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{Extreme \text{ Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2. \end{aligned}$$

*Proof.* Let

$$P :$$

$$V_1^{EXTERNAL}, E_1,$$

$$V_2^{EXTERNAL}, E_2,$$

$$\dots,$$

$$E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}$$



is a longest SuperHyperDuality taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. Then there's at least one SuperHyperDuality. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperDuality could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

136EXM22a

**Example 18.0.13.** In the Figure (31.5), the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , in the Extreme SuperHyperModel (31.5), is the Extreme SuperHyperDuality.

**Proposition 18.0.14.** Assume a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . Then,

$$\begin{aligned} \mathcal{C}(NSHG)_{Extremal} \text{ Quasi-SuperHyperDuality} &= \{E^* \in E_{ESHG:(V,E)}^*\}. \\ \mathcal{C}(NSHG)_{Extremal} \text{ Quasi-SuperHyperDuality SuperHyperPolynomial} \\ &= |i \mid E_i^* \in E_{ESHG:(V,E)}^*|_{Extremal \text{ Cardinality}} |z|. \\ \mathcal{C}(NSHG)_{Extremal} \text{ R-Quasi-SuperHyperDuality} &= \{CENTER \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Extremal} \text{ R-Quasi-SuperHyperDuality SuperHyperPolynomial} &= z. \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 P : \\
 &V_1^{EXTERNAL}, E_1^*, \\
 &V_2^{EXTERNAL}, E_2^*, \\
 &\dots, \\
 &E_{|E_{ESHG:(V,E)}^*|^{Extreme\ Cardinality}}^*, V_{|E_{ESHG:(V,E)}^*|^{Extreme\ Cardinality}+1}^{EXTERNAL}
 \end{aligned}$$

is a longest SuperHyperDuality taken from a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\
 \exists! E_z^* &\in E_{ESHG:(V,E)}^*, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z^* \equiv \\
 \exists! E_z^* &\in E_{ESHG:(V,E)}^*, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z^*.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. Then there's at least one SuperHyperDuality. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperDuality could be applied. The unique embedded SuperHyperDuality proposes some longest SuperHyperDuality excerpt from some representatives. The latter is straightforward. ■

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**Example 18.0.15.** In the Extreme Figure (31.6), the connected Extreme SuperHyperWheel  $NSHW : (V, E)$ , is Extreme highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperWheel  $ESHW : (V, E)$ , in the Extreme SuperHyperModel (31.6), is the Extreme SuperHyperDuality.

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# Extreme SuperHyperJoin But As The Extensions Excerpt From Dense And Super Forms

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**Definition 19.0.1.** (Different Extreme Types of Extreme SuperHyperJoin). 2878

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 2879  
SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called 2880

(i) **Extreme e-SuperHyperJoin** if  $\forall E_i \in E_{ESHG:(V,E)} \setminus E', \exists E_j \in E'$ , such that 2881  
 $V_a \in E_i, E_j$ ; and  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ; 2882

(ii) **Extreme re-SuperHyperJoin** if  $\forall E_i \in E_{ESHG:(V,E)} \setminus E', \exists E_j \in E'$ , such that 2883  
 $V_a \in E_i, E_j$ ;  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ; and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} =$  2884  
 $|E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 2885

(iii) **Extreme v-SuperHyperJoin** if  $\forall V_i \in E_{ESHG:(V,E)} \setminus V', \exists V_j \in V'$ , such that 2886  
 $V_i, V_j \notin E_a$ ; and  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; 2887

(iv) **Extreme rv-SuperHyperJoin** if  $\forall V_i \in E_{ESHG:(V,E)} \setminus V', \exists V_j \in V'$ , such that 2888  
 $V_i, V_j \in E_a$ ;  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} =$  2889  
 $|V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 2890

(v) **Extreme SuperHyperJoin** if it's either of Extreme e-SuperHyperJoin, Extreme re- 2891  
SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin. 2892

**Definition 19.0.2.** ((Extreme) SuperHyperJoin). 2893

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 2894  
SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 2895

(i) an **Extreme SuperHyperJoin** if it's either of Extreme e-SuperHyperJoin, Extreme 2896  
re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and 2897  
 $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme 2898  
cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme 2899  
SuperHyperEdges in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges 2900  
and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; 2901

- (ii) a **Extreme SuperHyperJoin** if it's either of Extreme e-SuperHyperJoin, Extreme re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for a Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; 2902-2907
- (iii) an **Extreme SuperHyperJoin SuperHyperPolynomial** if it's either of Extreme e-SuperHyperJoin, Extreme re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; and the Extreme power is corresponded to its Extreme coefficient; 2908-2915
- (iv) a **Extreme SuperHyperJoin SuperHyperPolynomial** if it's either of Extreme e-SuperHyperJoin, Extreme re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; and the Extreme power is corresponded to its Extreme coefficient; 2916-2923
- (v) an **Extreme R-SuperHyperJoin** if it's either of Extreme e-SuperHyperJoin, Extreme re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; 2924-2930
- (vi) a **Extreme R-SuperHyperJoin** if it's either of Extreme e-SuperHyperJoin, Extreme re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; 2931-2936
- (vii) an **Extreme R-SuperHyperJoin SuperHyperPolynomial** if it's either of Extreme e-SuperHyperJoin, Extreme re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; and the Extreme power is corresponded to its Extreme coefficient; 2937-2944

(viii) a **Extreme SuperHyperJoin SuperHyperPolynomial** if it's either of Extreme e-SuperHyperJoin, Extreme re-SuperHyperJoin, Extreme v-SuperHyperJoin, and Extreme rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; and the Extreme power is corresponded to its Extreme coefficient.

**Example 19.0.3.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in the mentioned Extreme Figures in every Extreme items.

- On the Figure (30.1), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward.  $E_1$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_2$  is a loop Extreme SuperHyperEdge and  $E_4$  is an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperJoin.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1, V_2, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.2), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward.  $E_1, E_2$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_4$  is an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperJoin.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1, V_2, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.3), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1, V_2, V_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.4), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2972  
 is up. The Extreme Algorithm is Extremely straightforward. 2973

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_4, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2974  
 is up. The Extreme Algorithm is Extremely straightforward. 2975

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2976  
 is up. The Extreme Algorithm is Extremely straightforward. 2977

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_{3i+1^3_{i=0}}, E_{3i+24^3_{i=0}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 6z^8. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_{3i+1^7_{i=0}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 6z^8.\end{aligned}$$

- On the Figure (30.7), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2978  
 is up. The Extreme Algorithm is Extremely straightforward. 2979

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_{15}, E_{16}, E_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.8), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2980  
 is up. The Extreme Algorithm is Extremely straightforward. 2981

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.9), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 2982  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_{3i+1^3_{i=0}}, E_{23}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 3z^5. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_{3i+1^3_{i=0}}, V_{15}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 3z^5.\end{aligned}$$

- On the Figure (30.10), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 2984  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.11), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 2986  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_1, E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_6, V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.12), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 2988  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1, V_{i=4}^{i \neq 5,7,8}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 5z^5.\end{aligned}$$

- On the Figure (30.13), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 2990  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_3, E_9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$



- On the Figure (30.14), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2992  
 is up. The Extreme Algorithm is Extremely straightforward. 2993

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.15), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2994  
 is up. The Extreme Algorithm is Extremely straightforward. 2995

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.16), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2996  
 is up. The Extreme Algorithm is Extremely straightforward. 2997

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= \\ (1 \times 5 \times 5) + (1 \times 2 + 1)z^3.\end{aligned}$$

- On the Figure (30.17), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 2998  
 is up. The Extreme Algorithm is Extremely straightforward. 2999

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$

- On the Figure (30.18), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, 3000  
 is up. The Extreme Algorithm is Extremely straightforward. 3001

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$

- On the Figure (30.19), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 3002 3003

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_{3i+1_{i=03}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 3z^4. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_{2i+1_{i=05}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 2z^6.\end{aligned}$$

- On the Figure (30.20), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 3004 3005

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 3006 3007

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Extreme SuperHyperNotion, namely, Extreme SuperHyperJoin, is up. The Extreme Algorithm is Extremely straightforward. 3008 3009

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin}} &= \{E_2, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin}} &= \{V_3, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperJoin SuperHyperPolynomial}} &= 10 \times 6 + 10 \times 6 + 12 \times 6 + 12 \times 6z^2.\end{aligned}$$

The previous Extreme approach apply on the upcoming Extreme results on Extreme SuperHyperClasses. 3010 3011

**Proposition 19.0.4.** Assume a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperJoin} = \\
 & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperJoin SuperHyperPolynomial} \\
 & = 3z^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e R-SuperHyperJoin} \\
 & = \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e R-SuperHyperJoin SuperHyperPolynomial} \\
 & = \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Extrem e Cardinality} z^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}^{EXTERNAL}.
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. ■

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**Example 19.0.5.** In the Figure (31.1), the connected Extreme SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.1), is the SuperHyperJoin.

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**Proposition 19.0.6.** Assume a connected Extreme SuperHyperCycle  $ESH C : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperJoin} = \\
 & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e SuperHyperJoin SuperHyperPolynomial} \\
 & = 3z^{\frac{|E_{ESHG:(V,E)}|_{Extrem e Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Extrem e R-SuperHyperJoin}
 \end{aligned}$$

$$= \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}.$$

$$\mathcal{C}(NSHG)_{Extreme R-SuperHyperJoin SuperHyperPolynomial}$$

$$= \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Extreme Cardinality} \approx \frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}.$$

*Proof.* Let

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$$P :$$

$$V_1^{EXTERNAL}, E_1,$$

$$V_2^{EXTERNAL}, E_2,$$

$$\dots,$$

$$E_{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}^{EXTERNAL}.$$

be a longest path taken from a connected Extreme SuperHyperCycle  $ESHG : (V, E)$ . There's a new way to redefine as

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$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. ■

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**Example 19.0.7.** In the Figure (31.2), the connected Extreme SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.2), is the Extreme SuperHyperJoin.

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**Proposition 19.0.8.** Assume a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . Then

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$$\mathcal{C}(NSHG)_{Extreme Quasi-SuperHyperJoin} = \{E \in E_{ESHG:(V,E)}\}.$$

$$\mathcal{C}(NSHG)_{Extreme Quasi-SuperHyperJoin SuperHyperPolynomial}$$

$$= |i| E_i \in E_{ESHG:(V,E)}|_{Extreme Cardinality}|z.$$

$$\mathcal{C}(NSHG)_{Extreme R-Quasi-SuperHyperJoin} = \{CENTER \in V_{ESHG:(V,E)}\}.$$

$$\mathcal{C}(NSHG)_{Extreme R-Quasi-SuperHyperJoin SuperHyperPolynomial} = z.$$

*Proof.* Let

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$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

be a longest path taken a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

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$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. ■

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**Example 19.0.9.** In the Figure (31.3), the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , in the Extreme SuperHyperModel (31.3), is the Extreme SuperHyperJoin.

**Proposition 19.0.10.** Assume a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Then

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperJoin}} \\
 &= (PERFECT \text{ MATCHING}). \\
 & \{E_i \in E_{P_i^{ESHG:(V,E)}}, \\
 & \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperJoin}} \\
 &= (OTHERWISE). \\
 & \{\}, \\
 & \text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{Extreme \text{ SuperHyperJoin SuperHyperPolynomial}} \\
 &= (PERFECT \text{ MATCHING}). \\
 &= (\sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) choose |P_i^{ESHG:(V,E)}|) \\
 & z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{Extreme \text{ SuperHyperJoin SuperHyperPolynomial}} \\
 &= (OTHERWISE)0. \\
 & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperJoin}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperJoin SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{Extreme \text{ Cardinality}}} = (\sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| choose 2) = z^2.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . There's

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a new way to redefine as

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$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. Then there’s no at least one SuperHyperJoin. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperJoin could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest SuperHyperJoin taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

The latter is straightforward.

■ 3052

136EXM21a

**Example 19.0.11.** In the Extreme Figure (31.4), the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , is Extreme highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Extreme Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , in the Extreme SuperHyperModel (31.4), is the Extreme SuperHyperJoin.

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**Proposition 19.0.12.** Assume a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Then

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$$\begin{aligned} \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperJoin}} \\ = (PERFECT \text{ MATCHING}). \\ \{E_i \in E_{P_i^{ESHG:(V,E)}}, \\ \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperJoin}} \end{aligned}$$

$$\begin{aligned}
&= (OTHERWISE). \\
&\{\}, \\
&\text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
&\mathcal{C}(NSHG)_{Extreme SuperHyperJoin SuperHyperPolynomial} \\
&= (PERFECT MATCHING). \\
&= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) choose |P_i^{ESHG:(V,E)}| \right) \\
&\sim \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}| \\
&\text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
&= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
&\mathcal{C}(NSHG)_{Extreme SuperHyperJoin SuperHyperPolynomial} \\
&= (OTHERWISE)0. \\
&\mathcal{C}(NSHG)_{Extreme Quasi-SuperHyperJoin} \\
&= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
&\mathcal{C}(NSHG)_{Extreme Quasi-SuperHyperJoin SuperHyperPolynomial} \\
&= \sum_{|V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}|_{Extremity Cardinality}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| choose 2) \right) = z^2.
\end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
&P : \\
&V_1^{EXTERNAL}, E_1, \\
&V_2^{EXTERNAL}, E_2, \\
&\dots, \\
&E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
\end{aligned}$$

is a longest SuperHyperJoin taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
&V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
&\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
&\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
\end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. Then there's no at least one SuperHyperJoin. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperJoin could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$P :$$

$$\begin{aligned}
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

136EXM22a

**Example 19.0.13.** In the Figure (31.5), the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , in the Extreme SuperHyperModel (31.5), is the Extreme SuperHyperJoin.

**Proposition 19.0.14.** Assume a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . Then,

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{Extreme \ SuperHyperJoin} = \\
 &= \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extreme \ Cardinality}}{3}}. \\
 &\mathcal{C}(NSHG)_{Extreme \ SuperHyperJoin \ SuperHyperPolynomial} \\
 &= 3z^{\frac{|E_{ESHG:(V,E)}|_{Extreme \ Cardinality}}{3}}. \\
 &\mathcal{C}(NSHG)_{Extreme \ R-SuperHyperJoin} \\
 &= \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extreme \ Cardinality}}{3}}. \\
 &\mathcal{C}(NSHG)_{Extreme \ R-SuperHyperJoin \ SuperHyperPolynomial} \\
 &= \prod |V^{EXTERNAL}_{ESHG:(V,E)}|_{Extreme \ Cardinality} z^{\frac{|E_{ESHG:(V,E)}|_{Extreme \ Cardinality}}{3}}.
 \end{aligned}$$

*Proof.* Let

$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\frac{|E_{ESHG:(V,E)}|_{Extreme \ Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Extreme \ Cardinality}}{3}}^{EXTERNAL}
 \end{aligned}$$



is a longest SuperHyperJoin taken from a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . 3080  
 There's a new way to redefine as 3081

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to 3082  
 $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. Then there's 3083  
 at least one SuperHyperJoin. Thus the notion of quasi isn't up and the SuperHyperNotions based 3084  
 on SuperHyperJoin could be applied. The unique embedded SuperHyperJoin proposes some 3085  
 longest SuperHyperJoin excerpt from some representatives. The latter is straightforward. ■ 3086

136EXM23a

**Example 19.0.15.** In the Extreme Figure (31.6), the connected Extreme SuperHyperWheel 3087  
 $NSHW : (V, E)$ , is Extreme highlighted and featured. The obtained Extreme SuperHyperSet, 3088  
 by the Algorithm in previous result, of the Extreme SuperHyperVertices of the connected 3089  
 Extreme SuperHyperWheel  $ESHW : (V, E)$ , in the Extreme SuperHyperModel (31.6), is the 3090  
 Extreme SuperHyperJoin. 3091

# Extreme SuperHyperPerfect But As The Extensions Excerpt From Dense And Super Forms

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**Definition 20.0.1.** (Different Extreme Types of Extreme SuperHyperPerfect). 3096

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 3097  
SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called 3098

(i) **Extreme e-SuperHyperPerfect** if  $\forall E_i \in E_{ESHG:(V,E)} \setminus E', \exists! E_j \in E',$  such that 3099  
 $V_a \in E_i, E_j;$  3100

(ii) **Extreme re-SuperHyperPerfect** if  $\forall E_i \in E_{ESHG:(V,E)} \setminus E', \exists! E_j \in E',$  such that 3101  
 $V_a \in E_i, E_j;$  and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}};$  3102

(iii) **Extreme v-SuperHyperPerfect** if  $\forall V_i \in V_{ESHG:(V,E)} \setminus V', \exists! V_j \in V',$  such that 3103  
 $V_i, V_j \in E_a;$  3104

(iv) **Extreme rv-SuperHyperPerfect** if  $\forall V_i \in V_{ESHG:(V,E)} \setminus V', \exists! V_j \in V',$  such that 3105  
 $V_i, V_j \in E_a;$  and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}};$  3106

(v) **Extreme SuperHyperPerfect** if it's either of Extreme e-SuperHyperPerfect, Extreme 3107  
re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv-SuperHyperPerfect. 3108

**Definition 20.0.2.** ((Extreme) SuperHyperPerfect). 3109

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 3110  
SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 3111

(i) an **Extreme SuperHyperPerfect** if it's either of Extreme e-SuperHyperPerfect, 3112  
Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv- 3113  
SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  3114  
is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme 3115  
cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence 3116  
of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the 3117  
Extreme SuperHyperPerfect; 3118

- (ii) a **Extreme SuperHyperPerfect** if it's either of Extreme e-SuperHyperPerfect, Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for a Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; 3119-3124
- (iii) an **Extreme SuperHyperPerfect SuperHyperPolynomial** if it's either of Extreme e-SuperHyperPerfect, Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; and the Extreme power is corresponded to its Extreme coefficient; 3125-3133
- (iv) a **Extreme SuperHyperPerfect SuperHyperPolynomial** if it's either of Extreme e-SuperHyperPerfect, Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; and the Extreme power is corresponded to its Extreme coefficient; 3134-3142
- (v) an **Extreme R-SuperHyperPerfect** if it's either of Extreme e-SuperHyperPerfect, Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; 3143-3149
- (vi) a **Extreme R-SuperHyperPerfect** if it's either of Extreme e-SuperHyperPerfect, Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; 3150-3155
- (vii) an **Extreme R-SuperHyperPerfect SuperHyperPolynomial** if it's either of Extreme e-SuperHyperPerfect, Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, and Extreme rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme 3156-3161

cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVer- 3162  
tices such that they form the Extreme SuperHyperPerfect; and the Extreme power is 3163  
corresponded to its Extreme coefficient; 3164

(viii) a **Extreme SuperHyperPerfect SuperHyperPolynomial** if it's either of Extreme 3165  
e-SuperHyperPerfect, Extreme re-SuperHyperPerfect, Extreme v-SuperHyperPerfect, 3166  
and Extreme rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph 3167  
 $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients 3168  
defined as the Extreme number of the maximum Extreme cardinality of the Extreme 3169  
SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality 3170  
conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such 3171  
that they form the Extreme SuperHyperPerfect; and the Extreme power is corresponded 3172  
to its Extreme coefficient. 3173

**Example 20.0.3.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in the 3174  
mentioned Extreme Figures in every Extreme items. 3175

- On the Figure (30.1), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPer- 3176  
fect, is up. The Extreme Algorithm is Extremely straightforward.  $E_1$  and  $E_3$  are some 3177  
empty Extreme SuperHyperEdges but  $E_2$  is a loop Extreme SuperHyperEdge and  $E_4$  is 3178  
an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's 3179  
only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is 3180  
Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme 3181  
endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme 3182  
SuperHyperPerfect. 3183

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.2), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3184  
Perfect, is up. The Extreme Algorithm is Extremely straightforward.  $E_1, E_2$  and  $E_3$  3185  
are some empty Extreme SuperHyperEdges but  $E_4$  is an Extreme SuperHyperEdge. 3186  
Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHy- 3187  
perEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that 3188  
there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme 3189  
SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperPerfect. 3190

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.3), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPer- 3191  
 fect, is up. The Extreme Algorithm is Extremely straightforward. 3192

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPer- 3193  
 fect, is up. The Extreme Algorithm is Extremely straightforward. 3194

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_4, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPer- 3195  
 fect, is up. The Extreme Algorithm is Extremely straightforward. 3196

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPer- 3197  
 fect, is up. The Extreme Algorithm is Extremely straightforward. 3198

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_{3i+1_{i=0}^3}, E_{3i+24_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 6z^8. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_{3i+1_{i=0}^7}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 6z^8.\end{aligned}$$

- On the Figure (30.7), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPer- 3199  
 fect, is up. The Extreme Algorithm is Extremely straightforward. 3200

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_{15}, E_{16}, E_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_3, V_6, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.8), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPer- 3201  
 fect, is up. The Extreme Algorithm is Extremely straightforward. 3202

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} = \{E_4\}.$$

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_3, V_6, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.9), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3203  
3204

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect}} &= \{E_{3i+1_{i=0}^3}, E_{23}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= 3z^5. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect}} &= \{V_{3i+1_{i=0}^3}, V_{15}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= 3z^5.\end{aligned}$$

- On the Figure (30.10), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3205  
3206

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_3, V_6, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.11), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3207  
3208

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_1, E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_6, V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 2z^2.\end{aligned}$$

- On the Figure (30.12), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3209  
3210

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_1, V_{i=4}^{i \neq 5,7,8}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 5z^5.\end{aligned}$$

- On the Figure (30.13), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3211  
3212

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_3, E_9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_1, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.14), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3213  
3214

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.15), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3215  
3216

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.16), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3217  
3218

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect}} &= \{V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= \\ (1 \times 5 \times 5) + (1 \times 2 + 1)z^3.\end{aligned}$$

- On the Figure (30.17), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3219  
3220

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$

- On the Figure (30.18), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3221  
3222

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$

- On the Figure (30.19), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3223  
3224

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_{3i+1_{i=03}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 3z^4. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect}} &= \{V_{2i+1_{i=05}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= 2z^6.\end{aligned}$$

- On the Figure (30.20), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3225  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3227  
3228

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Extreme SuperHyperNotion, namely, Extreme SuperHyperPerfect, is up. The Extreme Algorithm is Extremely straightforward. 3229  
3230

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect}} &= \{V_3, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 10 \times 6 + 10 \times 6 + 12 \times 6 + 12 \times 6z^2.\end{aligned}$$

The previous Extreme approach apply on the upcoming Extreme results on Extreme SuperHyperClasses. 3231  
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**Proposition 20.0.4.** Assume a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} = \\
 & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} \\
 & = 3z^{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}} \\
 & = \{V_i^{\text{EXTERNAL}}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect SuperHyperPolynomial}} \\
 & = \prod |V_i^{\text{EXTERNAL}}|_{ESHG:(V,E)}^{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}} z^{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{\text{EXTERNAL}}, E_1, \\
 & V_2^{\text{EXTERNAL}}, E_2, \\
 & \dots, \\
 & E_{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}^{\text{EXTERNAL}}.
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 & V_i^{\text{EXTERNAL}} \sim V_j^{\text{EXTERNAL}} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{\text{EXTERNAL}})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{\text{EXTERNAL}}$  in the literatures of SuperHyperPerfect. The latter is straightforward. ■

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136EXM18a

**Example 20.0.5.** In the Figure (31.1), the connected Extreme SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.1), is the SuperHyperPerfect.

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**Proposition 20.0.6.** Assume a connected Extreme SuperHyperCycle  $ESH C : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect}} = \\
 & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} \\
 & = 3z^{\frac{|E_{ESHG:(V,E)}|_{\text{Extreme Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperPerfect}}
 \end{aligned}$$

$$\begin{aligned}
 &= \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}. \\
 &\mathcal{C}(NSHG)_{Extreme R-SuperHyperPerfect SuperHyperPolynomial} \\
 &= \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Extreme Cardinality} \approx \frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Extreme Cardinality}}{3}}^{EXTERNAL}.
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperCycle  $ESHG : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. ■

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**Example 20.0.7.** In the Figure (31.2), the connected Extreme SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.2), is the Extreme SuperHyperPerfect.

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**Proposition 20.0.8.** Assume a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . Then

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{Extreme SuperHyperPerfect} = \{E \in E_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Extreme SuperHyperPerfect SuperHyperPolynomial} \\
 &= |i \mid E_i \in E_{ESHG:(V,E)}|_{Extreme Cardinality}|z. \\
 &\mathcal{C}(NSHG)_{Extreme R-SuperHyperPerfect} = \{CENTER \in V_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Extreme R-SuperHyperPerfect SuperHyperPolynomial} = z.
 \end{aligned}$$

*Proof.* Let

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$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

be a longest path taken a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. ■

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**Example 20.0.9.** In the Figure (31.3), the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , in the Extreme SuperHyperModel (31.3), is the Extreme SuperHyperPerfect.

**Proposition 20.0.10.** Assume a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Then

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect}} \\
 &= (PERFECT MATCHING). \\
 & \{E_i \in E_{P_i^{ESHG:(V,E)}}, \\
 & \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect}} \\
 &= (OTHERWISE). \\
 & \{\}, \\
 & \text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (PERFECT MATCHING). \\
 &= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose } |P_i^{ESHG:(V,E)}| \right) \\
 & \quad z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (OTHERWISE)0. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Extreme Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . There's

a new way to redefine as

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$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. Then there’s no at least one SuperHyperPerfect. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperPerfect could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest SuperHyperPerfect taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

The latter is straightforward.

■ 3274

136EXM21a

**Example 20.0.11.** In the Extreme Figure (31.4), the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , is Extreme highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Extreme Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , in the Extreme SuperHyperModel (31.4), is the Extreme SuperHyperPerfect.

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**Proposition 20.0.12.** Assume a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ .

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Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect}} \\
 &= (PERFECT MATCHING). \\
 & \{E_i \in E_{P_i^{ESHG:(V,E)}}, \\
 & \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect}} \\
 &= (OTHERWISE). \\
 & \{\}, \\
 & \text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (PERFECT MATCHING). \\
 &= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose } |P_i^{ESHG:(V,E)}| \right) \\
 & \sim \min_{i=|P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Extreme SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (OTHERWISE)0. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperPerfect SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Extreme Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2.
 \end{aligned}$$

Proof. Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest SuperHyperPerfect taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. Then there’s no at least one SuperHyperPerfect. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperPerfect could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|}, V_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|+1}^{EXTERNAL}$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|}, V_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|+1}^{EXTERNAL}$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

136EXM22a

**Example 20.0.13.** In the Figure (31.5), the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , in the Extreme SuperHyperModel (31.5), is the Extreme SuperHyperPerfect.

**Proposition 20.0.14.** Assume a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . Then,

$$\begin{aligned} \mathcal{C}(NSHG)_{Extreme \ SuperHyperPerfect} &= \{E \in E_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Extreme \ SuperHyperPerfect \ SuperHyperPolynomial} \\ &= |i \mid E_i \in E_{ESHG:(V,E)}|_{Extreme \ Cardinality} z. \\ \mathcal{C}(NSHG)_{Extreme \ R-SuperHyperPerfect} &= \{CENTER \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Extreme \ R-SuperHyperPerfect \ SuperHyperPolynomial} &= z. \end{aligned}$$

*Proof.* Let

$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

is a longest SuperHyperPerfect taken from a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. Then there's at least one SuperHyperPerfect. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperPerfect could be applied. The unique embedded SuperHyperPerfect proposes some longest SuperHyperPerfect excerpt from some representatives. The latter is straightforward. ■

136EXM23a

**Example 20.0.15.** In the Extreme Figure (31.6), the connected Extreme SuperHyperWheel  $NSHW : (V, E)$ , is Extreme highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperWheel  $ESHW : (V, E)$ , in the Extreme SuperHyperModel (31.6), is the Extreme SuperHyperPerfect.

# Extreme SuperHyperTotal But As The Extensions Excerpt From Dense And Super Forms

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**Definition 21.0.1.** (Different Extreme Types of Extreme SuperHyperTotal). 3320

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 3321  
SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called 3322

- (i) **Extreme e-SuperHyperTotal** if  $\forall E_i \in E_{ESHG:(V,E)}, \exists! E_j \in E'$ , such that  $V_a \in E_i, E_j$ ; 3323
- (ii) **Extreme re-SuperHyperTotal** if  $\forall E_i \in E_{ESHG:(V,E)}, \exists! E_j \in E'$ , such that  $V_a \in$  3324  
 $E_i, E_j$ ; and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 3325
- (iii) **Extreme v-SuperHyperTotal** if  $\forall V_i \in V_{ESHG:(V,E)}, \exists! V_j \in V'$ , such that  $V_i, V_j \in E_a$ ; 3326
- (iv) **Extreme rv-SuperHyperTotal** if  $\forall V_i \in V_{ESHG:(V,E)}, \exists! V_j \in V'$ , such that  $V_i, V_j \in E_a$ ; 3327  
and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 3328
- (v) **Extreme SuperHyperTotal** if it's either of Extreme e-SuperHyperTotal, Extreme 3329  
re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal. 3330

**Definition 21.0.2.** ((Extreme) SuperHyperTotal). 3331

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 3332  
SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 3333

- (i) an **Extreme SuperHyperTotal** if it's either of Extreme e-SuperHyperTotal, Extreme 3334  
re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal and 3335  
 $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme 3336  
cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme 3337  
SuperHyperEdges in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges 3338  
and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; 3339
- (ii) a **Extreme SuperHyperTotal** if it's either of Extreme e-SuperHyperTotal, Extreme 3340  
re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal 3341  
and  $\mathcal{C}(NSHG)$  for a Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum 3342  
Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  3343



- of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; 3344  
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- (iii) an **Extreme SuperHyperTotal SuperHyperPolynomial** if it's either of Extreme e-SuperHyperTotal, Extreme re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; and the Extreme power is corresponded to its Extreme coefficient; 3346  
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- (iv) a **Extreme SuperHyperTotal SuperHyperPolynomial** if it's either of Extreme e-SuperHyperTotal, Extreme re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; and the Extreme power is corresponded to its Extreme coefficient; 3355  
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- (v) an **Extreme R-SuperHyperTotal** if it's either of Extreme e-SuperHyperTotal, Extreme re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; 3364  
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- (vi) a **Extreme R-SuperHyperTotal** if it's either of Extreme e-SuperHyperTotal, Extreme re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; 3371  
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- (vii) an **Extreme R-SuperHyperTotal SuperHyperPolynomial** if it's either of Extreme e-SuperHyperTotal, Extreme re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; and the Extreme power is corresponded to its Extreme coefficient; 3377  
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(viii) a **Extreme SuperHyperTotal SuperHyperPolynomial** if it's either of Extreme e-SuperHyperTotal, Extreme re-SuperHyperTotal, Extreme v-SuperHyperTotal, and Extreme rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; and the Extreme power is corresponded to its Extreme coefficient. 3386-3394

**Example 21.0.3.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in the mentioned Extreme Figures in every Extreme items. 3395-3396

- On the Figure (30.1), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward.  $E_1$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_2$  is a loop Extreme SuperHyperEdge and  $E_4$  is an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperTotal. 3397-3404

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.2), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward.  $E_1, E_2$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_4$  is an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperTotal. 3405-3411

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.3), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3412-3413

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3414  
 is up. The Extreme Algorithm is Extremely straightforward. 3415

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-}} &= \{E_4, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3416  
 is up. The Extreme Algorithm is Extremely straightforward. 3417

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3418  
 is up. The Extreme Algorithm is Extremely straightforward. 3419

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= 20z^{10}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= 20z^{10}.\end{aligned}$$

- On the Figure (30.7), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3420  
 is up. The Extreme Algorithm is Extremely straightforward. 3421

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_{12}, E_{13}, E_{14}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_{12}, V_{13}, V_{14}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.8), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3422  
 is up. The Extreme Algorithm is Extremely straightforward. 3423

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_{12}, V_{13}, V_{14}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.9), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3424  
 is up. The Extreme Algorithm is Extremely straightforward. 3425

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_{i+1}_{i=0}^9\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} 10z^{10}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_{i+1}_{i=0}^9\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 20z^{10}.$$

- On the Figure (30.10), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3426 3427

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} = \{E_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_{12}, V_{13}, V_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 3 \times 4 \times 4z^3.$$

- On the Figure (30.11), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3428 3429

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_1, E_6, E_7, E_8\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} = 2z^4.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_1, V_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 3z^2.$$

- On the Figure (30.12), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3430 3431

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_1, E_2\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} = 5z^2.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_1, V_{i=1}^{i \neq 4,5,6}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = z^5.$$

- On the Figure (30.13), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3432 3433

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_3, E_9, E_6\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} = 3z^3.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_1, V_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 3z^2.$$

- On the Figure (30.14), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3434 3435

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_1, E_2\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} = z^2.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_1, V_3\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 2z^2.$$

- On the Figure (30.15), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3436  
 is up. The Extreme Algorithm is Extremely straightforward. 3437

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_2, V_3, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.16), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3438  
 is up. The Extreme Algorithm is Extremely straightforward. 3439

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= \\ 4 \times 3z^3.\end{aligned}$$

- On the Figure (30.17), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3440  
 is up. The Extreme Algorithm is Extremely straightforward. 3441

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= \\ 4 \times 3z^4.\end{aligned}$$

- On the Figure (30.18), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3442  
 is up. The Extreme Algorithm is Extremely straightforward. 3443

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= \\ 2 \times 4 \times 3z^4.\end{aligned}$$

- On the Figure (30.19), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, 3444  
 is up. The Extreme Algorithm is Extremely straightforward. 3445

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= 11z^{10}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 11z^{10}.\end{aligned}$$

- On the Figure (30.20), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3446  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_6, E_{10}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= 9z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= |(|V| - 1)z^2.\end{aligned}$$

- On the Figure (30.21), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3448  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_1, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= 9z^2.\end{aligned}$$

- On the Figure (30.22), the Extreme SuperHyperNotion, namely, Extreme SuperHyperTotal, is up. The Extreme Algorithm is Extremely straightforward. 3450  
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$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_3, V_{10}, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 3 \times 6z^3.\end{aligned}$$

The previous Extreme approach apply on the upcoming Extreme results on Extreme SuperHyperClasses. 3452  
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**Proposition 21.0.4.** Assume a connected Extreme SuperHyperPath  $ESH\mathcal{P} : (V, E)$ . Then 3454

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \\ &= \{E_i\}_{i=1}^{|E_{ESH\mathcal{G}:(V,E)}|_{\text{Extreme Cardinality}}-2}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^{|E_{ESH\mathcal{G}:(V,E)}|_{\text{Extreme Cardinality}}-2}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \\ &= \{V_i^{\text{EXTERNAL}}\}_{i=1}^{|E_{ESH\mathcal{G}:(V,E)}|_{\text{Extreme Cardinality}}-2}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= \prod |V^{\text{EXTERNAL}}_{ESH\mathcal{G}:(V,E)}|_{\text{Extreme Cardinality}} z^{|E_{ESH\mathcal{G}:(V,E)}|_{\text{Extreme Cardinality}}-2}\end{aligned}$$

*Proof.* Let

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$$\begin{aligned} P : \\ V_2^{EXTERNAL}, E_2, \\ V_3^{EXTERNAL}, E_3, \\ \dots \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . There's a 3456  
new way to redefine as 3457

$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to 3458  
 $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. ■ 3459

136EXM18a

**Example 21.0.5.** In the Figure (31.1), the connected Extreme SuperHyperPath  $ESH P : (V, E)$ , 3460  
is highlighted and featured. The Extreme SuperHyperSet, in the Extreme SuperHyperModel 3461  
(31.1), is the SuperHyperTotal. 3462

**Proposition 21.0.6.** Assume a connected Extreme SuperHyperCycle  $ESH C : (V, E)$ . Then 3463

$$\begin{aligned} \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal} &= \\ &= \{E_i\}_{i=1}^{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-2}. \\ \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal\ SuperHyperPolynomial} &= \\ &= (|E_{ESHG:(V,E)}|_{Extreme\ Cardinality} - 1) \\ &\quad z^{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-2}. \\ \mathcal{C}(NSHG)_{Extreme\ R-SuperHyperTotal} &= \\ &= \{V_i^{EXTERNAL}\}_{i=1}^{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-2}. \\ \mathcal{C}(NSHG)_{Extreme\ R-SuperHyperTotal\ SuperHyperPolynomial} &= \\ &= \prod |V^{EXTERNAL}_{ESHG:(V,E)}|_{Extreme\ Cardinality} z^{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-2} \end{aligned}$$

*Proof.* Let

3464

$$\begin{aligned} P : \\ V_2^{EXTERNAL}, E_2, \\ V_3^{EXTERNAL}, E_3, \\ \dots, \\ E_{\frac{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-1}{2}}, V^{EXTERNAL}_{ESHG:(V,E)|_{Extreme\ Cardinality}-1}. \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperCycle  $ESH C : (V, E)$ . There's a 3465  
new way to redefine as 3466

$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$



$$\begin{aligned} \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. ■

136EXM19a

**Example 21.0.7.** In the Figure (31.2), the connected Extreme SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.2), is the Extreme SuperHyperTotal.

**Proposition 21.0.8.** Assume a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . Then

$$\begin{aligned} \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal} &= \{E_i, E_j \in E_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal\ SuperHyperPolynomial} \\ &= |i(i-1)| \mid E_i \in E_{ESHG:(V,E)} \mid_{Extreme\ Cardinality} z^2. \\ \mathcal{C}(NSHG)_{Extreme\ R-SuperHyperTotal} &= \{CENTER, V_j \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Extreme\ R-SuperHyperTotal\ SuperHyperPolynomial} &= \\ &(|V_{ESHG:(V,E)}|_{Extreme\ Cardinality}) \text{ choose } (|V_{ESHG:(V,E)}|_{Extreme\ Cardinality} - 1) \\ &z^2. \end{aligned}$$

*Proof.* Let

$$P : V_i^{EXTERNAL}, E_i, CENTER, E_j.$$

be a longest path taken a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . There’s a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. ■

136EXM20a

**Example 21.0.9.** In the Figure (31.3), the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , in the Extreme SuperHyperModel (31.3), is the Extreme SuperHyperTotal.



**Proposition 21.0.10.** Assume a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Then 3482

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extreme \ SuperHyperTotal} \\
 &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\
 & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{Extreme \ SuperHyperTotal} \\
 & \mathcal{C}(NSHG)_{Extreme \ SuperHyperTotal \ SuperHyperPolynomial} \\
 &= z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{Extreme \ SuperHyperTotal} \\
 &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_b^{EXTERNAL} \in V_{P_j^{ESHG:(V,E)}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{Extreme \ Quasi-SuperHyperTotal \ SuperHyperPolynomial} \\
 &= \sum_{|V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}|_{Extremity \ Cardinality}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2.
 \end{aligned}$$

*Proof.* Let

3483

$$\begin{aligned}
 P : \\
 V_1^{EXTERNAL}, E_1, \\
 V_2^{EXTERNAL}, E_2
 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . There's 3484  
a new way to redefine as 3485

$$\begin{aligned}
 V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\
 \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\
 \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to 3486  
 $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. Then there's 3487  
no at least one SuperHyperTotal. Thus the notion of quasi may be up but the SuperHyperNotions 3488  
based on SuperHyperTotal could be applied. There are only two SuperHyperParts. Thus every 3489  
SuperHyperPart could have one SuperHyperVertex as the representative in the 3490

$$\begin{aligned}
 P : \\
 V_1^{EXTERNAL}, E_1, \\
 V_2^{EXTERNAL}, E_2
 \end{aligned}$$

is a longest SuperHyperTotal taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart 3491  
SuperHyperEdges are attained in any solution 3492  
3493

$$P :$$

$$V_1^{EXTERNAL}, E_1,$$

$$V_2^{EXTERNAL}, E_2$$

The latter is straightforward. ■ 3494

136EXM21a

**Example 21.0.11.** In the Extreme Figure (31.4), the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , is Extreme highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Extreme Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , in the Extreme SuperHyperModel (31.4), is the Extreme SuperHyperTotal. 3495  
3496  
3497  
3498  
3499

**Proposition 21.0.12.** Assume a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Then 3500  
3501

$$\begin{aligned} & \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal} \\ &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\ & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal} \\ & \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal\ SuperHyperPolynomial} \\ &= z^{\min |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\ & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\ &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{Extreme\ SuperHyperTotal} \\ &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_b^{EXTERNAL} \in V_{P_j^{ESHG:(V,E)}}, i \neq j\}. \\ & \mathcal{C}(NSHG)_{Extreme\ Quasi-SuperHyperTotal\ SuperHyperPolynomial} \\ &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{Extreme\ Cardinality}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{ choose } 2) \right) = z^2. \end{aligned}$$

*Proof.* Let 3502

$$P :$$

$$V_1^{EXTERNAL}, E_1,$$

$$V_2^{EXTERNAL}, E_2$$

is a longest SuperHyperTotal taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as 3503  
3504

$$\begin{aligned} & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. Then there's 3505  
3506

no at least one SuperHyperTotal. Thus the notion of quasi may be up but the SuperHyperNotions 3507  
based on SuperHyperTotal could be applied. There are only  $z'$  SuperHyperParts. Thus every 3508  
SuperHyperPart could have one SuperHyperVertex as the representative in the 3509

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$  3510  
( $V, E$ ). Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart 3511  
SuperHyperEdges are attained in any solution 3512

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . 3513  
The latter is straightforward. ■ 3514

136EXM22a

**Example 21.0.13.** In the Figure (31.5), the connected Extreme SuperHyperMultipartite 3515  
 $ESHM : (V, E)$ , is highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by 3516  
the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected 3517  
Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , in the Extreme SuperHyperModel (31.5), is 3518  
the Extreme SuperHyperTotal. 3519

**Proposition 21.0.14.** Assume a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . Then, 3520

$$\begin{aligned} \mathcal{C}(NSHG)_{Extreme \text{ SuperHyperTotal}} &= \{E_i, E_j \in E_{ESHG:(V,E)}^*\}. \\ \mathcal{C}(NSHG)_{Extreme \text{ SuperHyperTotal SuperHyperPolynomial}} \\ &= |i(i-1) \mid E_i \in E_{ESHG:(V,E)}^*|_{Extreme \text{ Cardinality}} z^2. \\ \mathcal{C}(NSHG)_{Extreme \text{ R-SuperHyperTotal}} &= \{CENTER, V_j \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Extreme \text{ R-SuperHyperTotal SuperHyperPolynomial}} &= \\ &(|V_{ESHG:(V,E)}|_{Extreme \text{ Cardinality}}) \text{ choose } (|V_{ESHG:(V,E)}|_{Extreme \text{ Cardinality}} - 1) \\ &z^2. \end{aligned}$$

*Proof.* Let

$$P : V_i^{EXTERNAL}, E_i^*, CENTER, E_j.$$

is a longest SuperHyperTotal taken from a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . 3522  
There's a new way to redefine as 3523

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. Then there’s at least one SuperHyperTotal. Thus the notion of quasi isn’t up and the SuperHyperNotions based on SuperHyperTotal could be applied. The unique embedded SuperHyperTotal proposes some longest SuperHyperTotal excerpt from some representatives. The latter is straightforward. ■

136EXM23a

**Example 21.0.15.** In the Extreme Figure (31.6), the connected Extreme SuperHyperWheel  $NSHW : (V, E)$ , is Extreme highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperWheel  $ESHW : (V, E)$ , in the Extreme SuperHyperModel (31.6), is the Extreme SuperHyperTotal.



# Extreme SuperHyperConnected But As The Extensions Excerpt From Dense And Super Forms

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**Definition 22.0.1.** (Different Extreme Types of Extreme SuperHyperConnected). 3539

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 3540

SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called 3541

(i) **Extreme e-SuperHyperConnected** if  $\forall E_i \in E_{ESHG:(V,E)} \setminus E', \exists E_j \in E'$ , such that 3542  
 $V_a \in E_i, E_j$ ; and  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ; 3543

(ii) **Extreme re-SuperHyperConnected** if  $\forall E_i \in E_{ESHG:(V,E)} \setminus E', \exists E_j \in E'$ , such that 3544  
 $V_a \in E_i, E_j$ ;  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ; and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} =$  3545  
 $|E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 3546

(iii) **Extreme v-SuperHyperConnected** if  $\forall V_i \in E_{ESHG:(V,E)} \setminus V', \exists V_j \in V'$ , such that 3547  
 $V_i, V_j \notin E_a$ ; and  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; 3548

(iv) **Extreme rv-SuperHyperConnected** if  $\forall V_i \in E_{ESHG:(V,E)} \setminus V', \exists V_j \in V'$ , such that 3549  
 $V_i, V_j \in E_a$ ;  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} =$  3550  
 $|V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 3551

(v) **Extreme SuperHyperConnected** if it's either of Extreme e-SuperHyperConnected, 3552  
Extreme re-SuperHyperConnected, Extreme v-SuperHyperConnected, and Extreme rv- 3553  
SuperHyperConnected. 3554

**Definition 22.0.2.** ((Extreme) SuperHyperConnected). 3555

Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider an Extreme 3556

SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 3557

(i) an **Extreme SuperHyperConnected** if it's either of Extreme e-SuperHyperConnected, 3558  
Extreme re-SuperHyperConnected, Extreme v-SuperHyperConnected, and Extreme rv- 3559  
SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  3560  
is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme 3561  
cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence 3562

- of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the  
Extreme SuperHyperConnected; 3563 3564
- (ii) a **Extreme SuperHyperConnected** if it's either of Extreme e-SuperHyperConnected, 3565  
Extreme re-SuperHyperConnected, Extreme v-SuperHyperConnected, and Extreme rv- 3566  
SuperHyperConnected and  $\mathcal{C}(NSHG)$  for a Extreme SuperHyperGraph  $NSHG : (V, E)$  3567  
is the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme 3568  
SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges 3569  
and Extreme SuperHyperVertices such that they form the Extreme SuperHyperConnected; 3570
- (iii) an **Extreme SuperHyperConnected SuperHyperPolynomial** if it's either of 3571  
Extreme e-SuperHyperConnected, Extreme re-SuperHyperConnected, Extreme v- 3572  
SuperHyperConnected, and Extreme rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an 3573  
Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial con- 3574  
tains the Extreme coefficients defined as the Extreme number of the maximum Extreme 3575  
cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high 3576  
Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHy- 3577  
perVertices such that they form the Extreme SuperHyperConnected; and the Extreme 3578  
power is corresponded to its Extreme coefficient; 3579
- (iv) a **Extreme SuperHyperConnected SuperHyperPolynomial** if it's either of 3580  
Extreme e-SuperHyperConnected, Extreme re-SuperHyperConnected, Extreme v- 3581  
SuperHyperConnected, and Extreme rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an 3582  
Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial con- 3583  
tains the Extreme coefficients defined as the Extreme number of the maximum Extreme 3584  
cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high 3585  
Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHy- 3586  
perVertices such that they form the Extreme SuperHyperConnected; and the Extreme 3587  
power is corresponded to its Extreme coefficient; 3588
- (v) an **Extreme R-SuperHyperConnected** if it's either of Extreme e-SuperHyperConnected, 3589  
Extreme re-SuperHyperConnected, Extreme v-SuperHyperConnected, and Extreme rv- 3590  
SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  3591  
is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme 3592  
cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence 3593  
of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the 3594  
Extreme SuperHyperConnected; 3595
- (vi) a **Extreme R-SuperHyperConnected** if it's either of Extreme e-SuperHyperConnected, 3596  
Extreme re-SuperHyperConnected, Extreme v-SuperHyperConnected, and Extreme rv- 3597  
SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  3598  
is the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme Su- 3599  
perHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges 3600  
and Extreme SuperHyperVertices such that they form the Extreme SuperHyperConnected; 3601
- (vii) an **Extreme R-SuperHyperConnected SuperHyperPolynomial** if it's either 3602  
of Extreme e-SuperHyperConnected, Extreme re-SuperHyperConnected, Extreme v- 3603  
SuperHyperConnected, and Extreme rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an 3604

Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperConnected; and the Extreme power is corresponded to its Extreme coefficient;

- (viii) a **Extreme SuperHyperConnected SuperHyperPolynomial** if it's either of Extreme e-SuperHyperConnected, Extreme re-SuperHyperConnected, Extreme v-SuperHyperConnected, and Extreme rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperConnected; and the Extreme power is corresponded to its Extreme coefficient.

**Example 22.0.3.** Assume an Extreme SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in the mentioned Extreme Figures in every Extreme items.

- On the Figure (30.1), the Extreme SuperHyperNotion, namely, Extreme SuperHyperConnected, is up. The Extreme Algorithm is Extremely straightforward.  $E_1$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_2$  is a loop Extreme SuperHyperEdge and  $E_4$  is an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperConnected.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.2), the Extreme SuperHyperNotion, namely, Extreme SuperHyperConnected, is up. The Extreme Algorithm is Extremely straightforward.  $E_1, E_2$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_4$  is an Extreme SuperHyperEdge. Thus in the terms of Extreme SuperHyperNeighbor, there's only one Extreme SuperHyperEdge, namely,  $E_4$ . The Extreme SuperHyperVertex,  $V_3$  is Extreme isolated means that there's no Extreme SuperHyperEdge has it as an Extreme endpoint. Thus the Extreme SuperHyperVertex,  $V_3$ , is excluded in every given Extreme SuperHyperConnected.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= 3z.\end{aligned}$$



- On the Figure (30.3), the Extreme SuperHyperNotion, namely, Extreme SuperHyperCon- 3637  
 nected, is up. The Extreme Algorithm is Extremely straightforward. 3638

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Extreme SuperHyperNotion, namely, Extreme SuperHyperCon- 3639  
 nected, is up. The Extreme Algorithm is Extremely straightforward. 3640

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_1, E_2, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Extreme SuperHyperNotion, namely, Extreme SuperHyperCon- 3641  
 nected, is up. The Extreme Algorithm is Extremely straightforward. 3642

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Extreme SuperHyperNotion, namely, Extreme SuperHyperCon- 3643  
 nected, is up. The Extreme Algorithm is Extremely straightforward. 3644

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 20z^{10}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 20z^{10}.\end{aligned}$$

- On the Figure (30.7), the Extreme SuperHyperNotion, namely, Extreme SuperHyperCon- 3645  
 nected, is up. The Extreme Algorithm is Extremely straightforward. 3646

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_{12}, E_{13}, E_{14}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_{12}, V_{13}, V_{14}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.8), the Extreme SuperHyperNotion, namely, Extreme SuperHyperCon- 3647  
 nected, is up. The Extreme Algorithm is Extremely straightforward. 3648

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} = \{E_4\}.$$

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_{12}, V_{13}, V_{14}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= \\ 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.9), the Extreme SuperHyperNotion, namely, Extreme SuperHyperCon- 3649  
nected, is up. The Extreme Algorithm is Extremely straightforward. 3650

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 10z^{10}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_{i+1}_{i=11}^9, V_{22}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= 20z^{10}.\end{aligned}$$

- On the Figure (30.10), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3651  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3652

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_{12}, V_{13}, V_{14}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= \\ 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.11), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3653  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3654

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_1, E_6, E_7, E_8\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 2z^4. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_1, V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 3z^2.\end{aligned}$$

- On the Figure (30.12), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3655  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3656

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_1, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= 5z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_1, V_{i=1}^{i \neq 4,5,6}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z^5.\end{aligned}$$

- On the Figure (30.13), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3657  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3658

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_3, E_9, E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 3z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_1, V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= 3z^2.\end{aligned}$$

- On the Figure (30.14), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3659  
 Connected, is up. The Extreme Algorithm is Extremely straightforward. 3660

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} = \{E_2\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} = \{V_1\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} = z.$$

- On the Figure (30.15), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3661  
 Connected, is up. The Extreme Algorithm is Extremely straightforward. 3662

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} = \{E_2, E_3, E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} = z^3.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} = \{V_2, V_3, V_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} = z^3.$$

- On the Figure (30.16), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3663  
 Connected, is up. The Extreme Algorithm is Extremely straightforward. 3664

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} = \{E_2, E_3, E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} = z^3.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} = \{V_2, V_6, V_{17}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} = 4 \times 3z^3.$$

- On the Figure (30.17), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3665  
 Connected, is up. The Extreme Algorithm is Extremely straightforward. 3666

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} = \{E_2, E_3, E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} = z^3.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} = \{V_1, V_2, V_6, V_{17}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} = 4 \times 3z^4.$$

- On the Figure (30.18), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3667  
 Connected, is up. The Extreme Algorithm is Extremely straightforward. 3668

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} = \{E_2, E_3, E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} = z^3.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} = \{V_1, V_2, V_6, V_{17}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} = 2 \times 4 \times 3z^4.$$

- On the Figure (30.19), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3669  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3670

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 11z^{10}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 11z^{10}.\end{aligned}$$

- On the Figure (30.20), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3671  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3672

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3673  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3674

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Extreme SuperHyperNotion, namely, Extreme SuperHyper- 3675  
Connected, is up. The Extreme Algorithm is Extremely straightforward. 3676

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_3, V_{10}, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 3 \times 6z^3.\end{aligned}$$

The previous Extreme approach apply on the upcoming Extreme results on Extreme 3677  
SuperHyperClasses. 3678

**Proposition 22.0.4.** Assume a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extrem e \text{ Quasi-SuperHyperConnected}} = \\
 & = \{E_i\}_{i=1}^{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{Extrem e \text{ Quasi-SuperHyperConnected SuperHyperPolynomial}} \\
 & = z^{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{Extrem e \text{ R-Quasi-SuperHyperConnected}} \\
 & = \{V_i^{EXTERNAL}\}_{i=1}^{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{Extrem e \text{ R-Quasi-SuperHyperConnected SuperHyperPolynomial}} \\
 & = \prod |V_i^{EXTERNAL}_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} z^{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 2}
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_2^{EXTERNAL}, E_2, \\
 & V_3^{EXTERNAL}, E_3, \\
 & \dots, \\
 & E_{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 1}, V_i^{EXTERNAL}_{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 1}.
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperPath  $ESH P : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESH G:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESH G:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. ■

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136EXM18a

**Example 22.0.5.** In the Figure (31.1), the connected Extreme SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.1), is the SuperHyperConnected.

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**Proposition 22.0.6.** Assume a connected Extreme SuperHyperCycle  $ESH C : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Extrem e \text{ Quasi-SuperHyperConnected}} = \\
 & = \{E_i\}_{i=1}^{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{Extrem e \text{ Quasi-SuperHyperConnected SuperHyperPolynomial}} \\
 & = (|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 1) \\
 & z^{|E_{ESH G:(V,E)}|_{Extrem e \text{ Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{Extrem e \text{ R-Quasi-SuperHyperConnected}}
 \end{aligned}$$

$$\begin{aligned}
 &= \{V_i^{EXTERNAL}\}_{i=1}^{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-2} \\
 &\mathcal{C}(NSHG)_{Extreme\ R-Quasi-SuperHyperConnected\ SuperHyperPolynomial} \\
 &= \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Extreme\ Cardinality} z^{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-2}
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 &P : \\
 &V_2^{EXTERNAL}, E_2, \\
 &V_3^{EXTERNAL}, E_3, \\
 &\dots, \\
 &E_{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-1}, V_i^{EXTERNAL}_{|E_{ESHG:(V,E)}|_{Extreme\ Cardinality}-1}.
 \end{aligned}$$

be a longest path taken from a connected Extreme SuperHyperCycle  $ESHG : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. ■

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136EXM19a

**Example 22.0.7.** In the Figure (31.2), the connected Extreme SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Extreme SuperHyperSet, in the Extreme SuperHyperModel (31.2), is the Extreme SuperHyperConnected.

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**Proposition 22.0.8.** Assume a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . Then

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{Extreme\ SuperHyperConnected} = \{E_i \in E_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Extreme\ SuperHyperConnected\ SuperHyperPolynomial} \\
 &= |i| \mid E_i \in |E_{ESHG:(V,E)}|_{Extreme\ Cardinality} z. \\
 &\mathcal{C}(NSHG)_{Extreme\ R-SuperHyperConnected} = \{CENTER \in V_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Extreme\ R-SuperHyperConnected\ SuperHyperPolynomial} = z.
 \end{aligned}$$

*Proof.* Let

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$$P : V_i^{EXTERNAL}, E_i, CENTER, E_j.$$

be a longest path taken a connected Extreme SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. ■

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3702

**Example 22.0.9.** In the Figure (31.3), the connected Extreme SuperHyperStar  $ESHS : (V, E)$ , 3703  
is highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous 3704  
Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperStar 3705  
 $ESHS : (V, E)$ , in the Extreme SuperHyperModel (31.3), is the Extreme SuperHyperConnected. 3706

**Proposition 22.0.10.** Assume a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Then 3707

$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} \\ &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\ & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} \\ &= z^{\min |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\ & \quad \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\ &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\ & \mathcal{C}(NSHG)_{\text{Extreme V-SuperHyperConnected}} \\ &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}, V_b^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}, i \neq j\}. \\ & \mathcal{C}(NSHG)_{\text{Extreme V-SuperHyperConnected SuperHyperPolynomial}} \\ &= \sum_{|V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}|_{\text{Extreme Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2. \end{aligned}$$

*Proof.* Let

3708

$$\begin{aligned} & P : \\ & V_1^{EXTERNAL}, E_1, \\ & V_2^{EXTERNAL}, E_2 \end{aligned}$$

is a longest path taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . There's 3709  
a new way to redefine as 3710

$$\begin{aligned} & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to 3711  
 $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. Then 3712  
there's no at least one SuperHyperConnected. Thus the notion of quasi may be up but the 3713  
SuperHyperNotions based on SuperHyperConnected could be applied. There are only two 3714  
SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the 3715  
representative in the 3716

$$\begin{aligned} & P : \\ & V_1^{EXTERNAL}, E_1, \\ & V_2^{EXTERNAL}, E_2 \end{aligned}$$

is a longest SuperHyperConnected taken from a connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

The latter is straightforward. ■

**Example 22.0.11.** In the Extreme Figure (31.4), the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , is Extreme highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Extreme Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperBipartite  $ESHB : (V, E)$ , in the Extreme SuperHyperModel (31.4), is the Extreme SuperHyperConnected.

**Proposition 22.0.12.** Assume a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Then

$$\begin{aligned} & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperConnected}} \\ &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\ & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{Extreme \text{ Quasi-SuperHyperConnected SuperHyperPolynomial}} \\ &= z^{\min |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\ & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\ &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{Extreme \text{ V-SuperHyperConnected}} \\ &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_b^{EXTERNAL} \in V_{P_j^{ESHG:(V,E)}}, i \neq j\}. \\ & \mathcal{C}(NSHG)_{Extreme \text{ V-SuperHyperConnected SuperHyperPolynomial}} \\ &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{Extreme \text{ Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{ choose } 2) \right) = z^2. \end{aligned}$$

*Proof.* Let

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest SuperHyperConnected taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$



The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. Then there’s no at least one SuperHyperConnected. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperConnected could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Extreme-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest path taken from a connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

136EXM22a

**Example 22.0.13.** In the Figure (31.5), the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Extreme featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous Extreme result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperMultipartite  $ESHM : (V, E)$ , in the Extreme SuperHyperModel (31.5), is the Extreme SuperHyperConnected.

**Proposition 22.0.14.** Assume a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . Then,

$$\begin{aligned} \mathcal{C}(NSHG)_{Extreme \ SuperHyperConnected} &= \{E_i \in E_{ESHG:(V,E)}^*\}. \\ \mathcal{C}(NSHG)_{Extreme \ SuperHyperConnected \ SuperHyperPolynomial} \\ &= |i \mid E_i \in |E_{ESHG:(V,E)}^*|_{Extreme \ Cardinality}|z. \\ \mathcal{C}(NSHG)_{Extreme \ V-SuperHyperConnected} &= \{CENTER \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Extreme \ V-SuperHyperConnected \ SuperHyperPolynomial} &= z. \end{aligned}$$

*Proof.* Let

$$P : V^{EXTERNAL}_i, E^*_i, CENTER, E_j.$$

is a longest SuperHyperConnected taken from a connected Extreme SuperHyperWheel  $ESHW : (V, E)$ . There’s a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} &\equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. Then there’s at least one SuperHyperConnected. Thus the notion of quasi isn’t up and the SuperHyperNotions based on SuperHyperConnected could be applied. The unique embedded SuperHyperConnected proposes some longest SuperHyperConnected excerpt from some representatives. The latter is straightforward. ■

136EXM23a

**Example 22.0.15.** In the Extreme Figure (31.6), the connected Extreme SuperHyperWheel  $NSHW : (V, E)$ , is Extreme highlighted and featured. The obtained Extreme SuperHyperSet, by the Algorithm in previous result, of the Extreme SuperHyperVertices of the connected Extreme SuperHyperWheel  $ESHW : (V, E)$ , in the Extreme SuperHyperModel (31.6), is the Extreme SuperHyperConnected.



## CHAPTER 23

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# Background

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There are some scientific researches covering the topic of this research. In what follows, there are some discussion and literature reviews about them.

The seminal paper and groundbreaking article is titled “neutrosophic co-degree and neutrosophic degree alongside chromatic numbers in the setting of some classes related to neutrosophic hypergraphs” in **Ref. [HG1]** by Henry Garrett (2022). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on general forms without using neutrosophic classes of neutrosophic SuperHyperGraph. It’s published in prestigious and fancy journal is entitled “Journal of Current Trends in Computer Science Research (JCTCSR)” with ISO abbreviation “J Curr Trends Comp Sci Res” in volume 1 and issue 1 with pages 06-14. The research article studies deeply with choosing neutrosophic hypergraphs instead of neutrosophic SuperHyperGraph. It’s the breakthrough toward independent results based on initial background.

The seminal paper and groundbreaking article is titled “Super Hyper Dominating and Super Hyper Resolving on Neutrosophic Super Hyper Graphs and Their Directions in Game Theory and Neutrosophic Super Hyper Classes” in **Ref. [HG2]** by Henry Garrett (2022). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on fundamental SuperHyperNumber and using neutrosophic SuperHyperClasses of neutrosophic SuperHyperGraph. It’s published in prestigious and fancy journal is entitled “Journal of Mathematical Techniques and Computational Mathematics(JMTCM)” with ISO abbreviation “J Math Techniques Comput Math” in volume 1 and issue 3 with pages 242-263. The research article studies deeply with choosing directly neutrosophic SuperHyperGraph and SuperHyperGraph. It’s the breakthrough toward independent results based on initial background and fundamental SuperHyperNumbers.

The seminal paper and groundbreaking article is titled “Some Super Hyper Degrees and Co-Super Hyper Degrees on Neutrosophic Super Hyper Graphs And Super Hyper Graphs Alongside Applications in Cancer’s Treatments” in **Ref. [HG3]** by Henry Garrett (2023). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on fundamental notions and using vital tools in Cancer’s Treatments. It’s published in prestigious and fancy journal is entitled “Journal of Mathematical Techniques and Computational Mathematics(JMTCM)” with ISO abbreviation “J Math Techniques Comput Math” in volume 2 and issue 1 with pages 35-47. The research article studies deeply with choosing directly neutrosophic SuperHyperGraph and SuperHyperGraph. It’s the breakthrough toward independent results based on initial background and fundamental SuperHyperNumbers.

In some articles are titled “0039 | Closing Numbers and Super-Closing Numbers as (Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-SuperHyperGraph” in **Ref. [HG4]** by Henry Garrett (2022), “0049 | (Failed)1-Zero-Forcing Number in Neutrosophic Graphs” in **Ref. [HG5]** by Henry Garrett (2022), “Extreme SuperHyperClique as the Firm Scheme of Confrontation under Cancer’s Recognition as the Model in The Setting of (Neutrosophic) SuperHyperGraphs” in **Ref. [HG6]** by Henry Garrett (2022), “Uncertainty On The Act And Effect Of Cancer Alongside The Foggy Positions Of Cells Toward Neutrosophic Failed SuperHyperClique inside Neutrosophic SuperHyperGraphs Titled Cancer’s Recognition” in **Ref. [HG7]** by Henry Garrett (2022), “Neutrosophic Version Of Separates Groups Of Cells In Cancer’s Recognition On Neutrosophic SuperHyperGraphs” in **Ref. [HG8]** by Henry Garrett (2022), “The Shift Paradigm To Classify Separately The Cells and Affected Cells Toward The Totality Under Cancer’s Recognition By New Multiple Definitions On the Sets Polynomials Alongside Numbers In The (Neutrosophic) SuperHyperMatching Theory Based on SuperHyperGraph and Neutrosophic SuperHyperGraph” in **Ref. [HG9]** by Henry Garrett (2022), “Breaking the Continuity and Uniformity of Cancer In The Worst Case of Full Connections With Extreme Failed SuperHyperClique In Cancer’s Recognition Applied in (Neutrosophic) SuperHyperGraphs” in **Ref. [HG10]** by Henry Garrett (2022), “Neutrosophic Failed SuperHyperStable as the Survivors on the Cancer’s Neutrosophic Recognition Based on Uncertainty to All Modes in Neutrosophic SuperHyperGraphs” in **Ref. [HG11]** by Henry Garrett (2022), “Extremism of the Attacked Body Under the Cancer’s Circumstances Where Cancer’s Recognition Titled (Neutrosophic) SuperHyperGraphs” in **Ref. [HG12]** by Henry Garrett (2022), “(Neutrosophic) 1-Failed SuperHyperForcing in Cancer’s Recognitions And (Neutrosophic) SuperHyperGraphs” in **Ref. [HG13]** by Henry Garrett (2022), “Neutrosophic Messy-Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer’s Neutrosophic Recognitions In Special ViewPoints” in **Ref. [HG14]** by Henry Garrett (2022), “Neutrosophic 1-Failed SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer’s Neutrosophic Recognition And Beyond” in **Ref. [HG15]** by Henry Garrett (2022), “(Neutrosophic) SuperHyperStable on Cancer’s Recognition by Well-SuperHyperModelled (Neutrosophic) SuperHyperGraphs ” in **Ref. [HG16]** by Henry Garrett (2022), “Neutrosophic Messy-Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer’s Neutrosophic Recognitions In Special ViewPoints” in **Ref. [HG12]** by Henry Garrett (2022), “Basic Notions on (Neutrosophic) SuperHyperForcing And (Neutrosophic) SuperHyperModeling in Cancer’s Recognitions And (Neutrosophic) SuperHyperGraphs” in **Ref. [HG17]** by Henry Garrett (2022), “Neutrosophic Messy-Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer’s Neutrosophic Recognitions In Special ViewPoints” in **Ref. [HG18]** by Henry Garrett (2022), “(Neutrosophic) SuperHyperModeling of Cancer’s Recognitions Featuring (Neutrosophic) SuperHyperDefensive SuperHyperAlliances” in **Ref. [HG19]** by Henry Garrett (2022), “(Neutrosophic) SuperHyperAlliances With SuperHyperDefensive and SuperHyperOffensive Type-SuperHyperSet On (Neutrosophic) SuperHyperGraph With (Neutrosophic) SuperHyperModeling of Cancer’s Recognitions And Related (Neutrosophic) SuperHyperClasses” in **Ref. [HG20]** by Henry Garrett (2022), “SuperHyperGirth on SuperHyperGraph and Neutrosophic SuperHyperGraph With SuperHyperModeling of Cancer’s Recognitions” in **Ref. [HG21]** by Henry Garrett (2022), “Some SuperHyperDegrees and Co-SuperHyperDegrees on Neutrosophic SuperHyperGraphs and SuperHyperGraphs Alongside Applications in Cancer’s Treatments” in **Ref. [HG22]** by Henry Garrett (2022), “SuperHyperDominating and SuperHyperResolving on Neutrosophic SuperHyperGraphs And

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**HG187; HG188; HG189; HG190; HG191; HG192; HG193; HG194; HG195; HG196; HG197; HG198; HG199; HG200; HG201; HG203**], there are some endeavors to formalize the basic SuperHyperNotions about neutrosophic SuperHyperGraph and SuperHyperGraph. Some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in **Ref. [HG39]** by Henry Garrett (2022) which is indexed by Google Scholar and has more than 3230 readers in Scribd. It's titled "Beyond Neutrosophic Graphs" and published by Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United State. This research book covers different types of notions and settings in neutrosophic graph theory and neutrosophic SuperHyperGraph theory. Also, some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in **Ref. [HG40]** by Henry Garrett (2022) which is indexed by Google Scholar and has more than 4117 readers in Scribd. It's titled "Neutrosophic Duality" and published by Florida: GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. This research book presents different types of notions SuperHyperResolving and SuperHyperDominating in the setting of duality in neutrosophic graph theory and neutrosophic SuperHyperGraph theory. This research book has scrutiny on the complement of the intended set and the intended set, simultaneously. It's smart to consider a set but acting on its complement that what's done in this research book which is popular in the terms of high readers in Scribd. See the seminal scientific researches [**HG1; HG2; HG3**]. The formalization of the notions on the framework of notions in SuperHyperGraphs, Neutrosophic notions in SuperHyperGraphs theory, and (Neutrosophic) SuperHyperGraphs theory at [**HG4; HG5; HG6; HG7; HG8; HG9; HG10; HG11; HG12; HG13; HG14; HG15; HG16; HG17; HG18; HG19; HG20; HG21; HG22; HG23; HG24; HG25; HG26; HG27; HG28; HG29; HG30; HG31; HG32; HG33; HG34; HG35; HG36; HG37; HG38; HG94; HG942; HG95; HG952; HG96; HG962; HG97; HG972; HG98; HG982; HG106; HG107; HG111; HG112; HG115; HG116; HG120; HG121; HG122; HG123; HG124; HG125; HG126; HG127; HG128; HG129; HG130; HG131; HG132; HG134; HG135; HG136; HG137; HG138; HG139; HG140; HG141; HG142; HG143; HG144; HG145; HG146; HG147; HG148; HG149; HG150; HG151; HG152; HG153; HG154; HG155; HG156; HG157; HG158; HG159; HG160; HG161; HG162; HG163; HG164; HG165; HG166; HG167; HG168; HG169; HG170; HG171; HG172; HG173; HG174; HG175; HG176; HG177; HG178; HG179; HG180; HG181; HG182; HG183; HG184; HG185; HG186; HG187; HG188; HG189; HG190; HG191; HG192; HG193; HG194; HG195; HG196; HG197; HG198; HG199; HG200; HG201; HG203**]. Two popular scientific research books in Scribd in the terms of high readers, 3230 and 4117 respectively, on neutrosophic science is on [**HG39; HG40**].



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HG27	[109] Henry Garrett, “ <i>Indeterminacy On The All Possible Connections of Cells In Front of Cancer’s Attacks In The Terms of Neutrosophic Failed SuperHyperClique on Cancer’s Recognition called Neutrosophic SuperHyperGraphs</i> ”, ResearchGate 2023, (doi: 10.13140/RG.2.2.15897.70243).	4271 4272 4273 4274
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HG34	[122] Henry Garrett, “ <i>Neutrosophic 1-Failed SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer’s Neutrosophic Recognition And Beyond</i> ”, ResearchGate 2022, (doi: 10.13140/RG.2.2.36141.77287).	4314 4315 4316
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## Cancer In Neutrosophic SuperHyperGraph

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The cancer is the Neutrosophic disease but the Neutrosophic model is going to figure out what's going on this Neutrosophic phenomenon. The special Neutrosophic case of this Neutrosophic disease is considered and as the consequences of the model, some parameters are used. The cells are under attack of this disease but the moves of the cancer in the special region are the matter of mind. The Neutrosophic recognition of the cancer could help to find some Neutrosophic treatments for this Neutrosophic disease.

In the following, some Neutrosophic steps are Neutrosophic devised on this disease.

**Step 1. (Neutrosophic Definition)** The Neutrosophic recognition of the cancer in the long-term Neutrosophic function.

**Step 2. (Neutrosophic Issue)** The specific region has been assigned by the Neutrosophic model [it's called Neutrosophic SuperHyperGraph] and the long Neutrosophic cycle of the move from the cancer is identified by this research. Sometimes the move of the cancer hasn't be easily identified since there are some determinacy, indeterminacy and neutrality about the moves and the effects of the cancer on that region; this event leads us to choose another model [it's said to be Neutrosophic SuperHyperGraph] to have convenient perception on what's happened and what's done.

**Step 3. (Neutrosophic Model)** There are some specific Neutrosophic models, which are well-known and they've got the names, and some general Neutrosophic models. The moves and the Neutrosophic traces of the cancer on the complex tracks and between complicated groups of cells could be fantasized by a Neutrosophic SuperHyperPath(-/SuperHyperK-Domination, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the Neutrosophic SuperHyperK-Domination or the Neutrosophic SuperHyperK-Domination in those Neutrosophic Neutrosophic SuperHyper-Models.

Some cells have been faced with some attacks from the situation which is caused by the cancer's attacks. In this case, there are some embedded analysis on the ongoing situations which in that, the cells could be labelled as some groups and some groups or individuals have excessive labels which all are raised from the behaviors to overcome the cancer's attacks. In the embedded situations, the individuals of cells and the groups of cells could be considered

as “new groups”. Thus it motivates us to find the proper SuperHyperModels for getting more  
proper analysis on this messy story. I’ve found the SuperHyperModels which are officially called  
“SuperHyperGraphs” and “Neutrosophic SuperHyperGraphs”. In this SuperHyperModel, the  
cells and the groups of cells are defined as “SuperHyperVertices” and the relations between the  
individuals of cells and the groups of cells are defined as “SuperHyperEdges”. Thus it’s another  
motivation for us to do research on this SuperHyperModel based on the “Cancer’s Recognition”.  
Sometimes, the situations get worst. The situation is passed from the certainty and precise style.  
Thus it’s the beyond them. There are three descriptions, namely, the degrees of determinacy,  
indeterminacy and neutrality, for any object based on vague forms, namely, incomplete data,  
imprecise data, and uncertain analysis. The latter model could be considered on the previous  
SuperHyperModel. It’s SuperHyperModel. It’s SuperHyperGraph but it’s officially called  
“Neutrosophic SuperHyperGraphs”. The cancer is the disease but the model is going to figure  
out what’s going on this phenomenon. The special case of this disease is considered and as the  
consequences of the model, some parameters are used. The cells are under attack of this disease  
but the moves of the cancer in the special region are the matter of mind. The recognition of  
the cancer could help to find some treatments for this disease. The SuperHyperGraph and  
Neutrosophic SuperHyperGraph are the SuperHyperModels on the “Cancer’s Recognition” and  
both bases are the background of this research. Sometimes the cancer has been happened on the  
region, full of cells, groups of cells and embedded styles. In this segment, the SuperHyperModel  
proposes some SuperHyperNotions based on the connectivities of the moves of the cancer  
in the forms of alliances’ styles with the formation of the design and the architecture are  
formally called “ SuperHyperK-Domination” in the themes of jargons and buzzwords. The  
prefix “SuperHyper” refers to the theme of the embedded styles to figure out the background for  
the SuperHyperNotions. The recognition of the cancer in the long-term function. The specific  
region has been assigned by the model [it’s called SuperHyperGraph] and the long cycle of the  
move from the cancer is identified by this research. Sometimes the move of the cancer hasn’t be  
easily identified since there are some determinacy, indeterminacy and neutrality about the moves  
and the effects of the cancer on that region; this event leads us to choose another model [it’s  
said to be Neutrosophic SuperHyperGraph] to have convenient perception on what’s happened  
and what’s done. There are some specific models, which are well-known and they’ve got the  
names, and some general models. The moves and the traces of the cancer on the complex tracks  
and between complicated groups of cells could be fantasized by a Neutrosophic SuperHyperPath  
(-/SuperHyperK-Domination, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite,  
SuperHyperWheel). The aim is to find either the optimal SuperHyperK-Domination or the  
Neutrosophic SuperHyperK-Domination in those Neutrosophic SuperHyperModels. Some  
general results are introduced. Beyond that in SuperHyperStar, all possible Neutrosophic  
SuperHyperPath s have only two SuperHyperEdges but it’s not enough since it’s essential to  
have at least three SuperHyperEdges to form any style of a SuperHyperK-Domination. There  
isn’t any formation of any SuperHyperK-Domination but literarily, it’s the deformation of any  
SuperHyperK-Domination. It, literarily, deforms and it doesn’t form.

**Question 24.0.1.** *How to define the SuperHyperNotions and to do research on them to find the “  
amount of SuperHyperK-Domination” of either individual of cells or the groups of cells based on  
the fixed cell or the fixed group of cells, extensively, the “amount of SuperHyperK-Domination”  
based on the fixed groups of cells or the fixed groups of group of cells?*

**Question 24.0.2.** *What are the best descriptions for the “Cancer’s Recognition” in terms of*

*these messy and dense SuperHyperModels where embedded notions are illustrated?*

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It's motivation to find notions to use in this dense model is titled "SuperHyperGraphs".  
Thus it motivates us to define different types of "SuperHyperK-Domination" and "Neutrosophic  
SuperHyperK-Domination" on "SuperHyperGraph" and "Neutrosophic SuperHyperGraph".  
Then the research has taken more motivations to define SuperHyperClasses and to find some  
connections amid this SuperHyperNotion with other SuperHyperNotions. It motivates us to get  
some instances and examples to make clarifications about the framework of this research. The  
general results and some results about some connections are some avenues to make key point of  
this research, "Cancer's Recognition", more understandable and more clear.  
Some SuperHyperClasses and some Neutrosophic SuperHyperClasses are the cases of this  
research on the modeling of the regions where are under the attacks of the cancer to  
recognize this disease as it's mentioned on the title "Cancer's Recognitions". To formalize  
the instances on the SuperHyperNotion, SuperHyperK-Domination, the new SuperHyperClasses  
and SuperHyperClasses, are introduced. Some general results are gathered in the section on the  
SuperHyperK-Domination and the Neutrosophic SuperHyperK-Domination. The clarifications,  
instances and literature reviews have taken the whole way through. In this scientific research,  
the literature reviews have fulfilled the lines containing the notions and the results. The  
SuperHyperGraph and Neutrosophic SuperHyperGraph are the SuperHyperModels on the  
"Cancer's Recognitions" and both bases are the background of this research. Sometimes the  
cancer has been happened on the region, full of cells, groups of cells and embedded styles. In  
this scientific segment, the SuperHyperModel proposes some SuperHyperNotions based on the  
connectivities of the moves of the cancer in the longest and strongest styles with the formation of  
the design and the architecture are formally called "SuperHyperK-Domination" in the themes  
of jargons and buzzwords. The prefix "SuperHyper" refers to the theme of the embedded styles  
to figure out the background for the SuperHyperNotions.





## Neutrosophic Vertex-Decomposition

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## CHAPTER 26

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### **New Ideas In Cancer's Recognition And Neutrosophic SuperHyperGraph By Vertex-Decomposition As Hyper Decompress On Super Decomensation**

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## CHAPTER 27

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### ABSTRACT

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In this scientific research, (Different Neutrosophic Types of Neutrosophic SuperHyperVertex- 4514  
Decomposition). Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a Vertex- 4515  
Decomposition pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  4516  
and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called Neutrosophic e-SuperHyperVertex- 4517  
Decomposition if the following expression is called Neutrosophic e-SuperHyperVertex- 4518  
Decomposition criteria holds 4519

$$\forall E' : E' \text{ is disconnect-able;}$$

Neutrosophic re-SuperHyperVertex-Decomposition if the following expression is called Neutro- 4520  
sophic e-SuperHyperVertex-Decomposition criteria holds 4521

$$\forall E' : E' \text{ is disconnect-able;}$$

and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; Neutrosophic v- 4522  
SuperHyperVertex-Decomposition if the following expression is called Neutrosophic v- 4523  
SuperHyperVertex-Decomposition criteria holds 4524

$$\forall V' : V' \text{ is disconnect-able;}$$

Neutrosophic rv-SuperHyperVertex-Decomposition if the following expression is called Neutro- 4525  
sophic v-SuperHyperVertex-Decomposition criteria holds 4526

$$\forall V' : V' \text{ is disconnect-able;}$$

and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; Neutrosophic 4527  
SuperHyperVertex-Decomposition if it's either of Neutrosophic e-SuperHyperVertex- 4528  
Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v- 4529  
SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition. 4530  
((Neutrosophic) SuperHyperVertex-Decomposition). Assume a Neutrosophic SuperHyper- 4531  
Graph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperEdge (NSHE) 4532  
 $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called an Extreme SuperHyperVertex-Decomposition if it's 4533  
either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex- 4534  
Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv- 4535  
SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph 4536

$NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high  
 Extreme cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence  
 of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme  
 SuperHyperVertex-Decomposition; a Neutrosophic SuperHyperVertex-Decomposition if it's  
 either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-  
 Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-  
 SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  
 $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHy-  
 perEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive  
 Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the  
 Neutrosophic SuperHyperVertex-Decomposition; an Extreme SuperHyperVertex-Decomposition  
 SuperHyperPolynomial if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutro-  
 sophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition,  
 and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme Super-  
 rHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme  
 coefficients defined as the Extreme number of the maximum Extreme cardinality of the  
 Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality  
 conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they  
 form the Extreme SuperHyperVertex-Decomposition; and the Extreme power is corresponded  
 to its Extreme coefficient; a Neutrosophic SuperHyperVertex-Decomposition SuperHyper-  
 Polynomial if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic  
 re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and  
 Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHy-  
 perGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic  
 coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the  
 Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardin-  
 ality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices  
 such that they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic  
 power is corresponded to its Neutrosophic coefficient; an Extreme V-SuperHyperVertex-  
 Decomposition if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic  
 re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and  
 Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHy-  
 perGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  
 $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive  
 Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that  
 they form the Extreme SuperHyperVertex-Decomposition; a Neutrosophic V-SuperHyperVertex-  
 Decomposition if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutro-  
 sophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition,  
 and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic  
 SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutro-  
 sophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic  
 cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHy-  
 perVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; an  
 Extreme V-SuperHyperVertex-Decomposition SuperHyperPolynomial if it's either of Neutro-  
 sophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition,  
 Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-

Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the  
Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme  
number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme  
SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges  
and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-  
Decomposition; and the Extreme power is corresponded to its Extreme coefficient; a Neutrosophic  
SuperHyperVertex-Decomposition SuperHyperPolynomial if it's either of Neutrosophic  
e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition,  
Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-  
Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is  
the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as  
the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic  
SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive  
Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that  
they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic power is  
corresponded to its Neutrosophic coefficient. In this scientific research, new setting is introduced  
for new SuperHyperNotions, namely, a SuperHyperVertex-Decomposition and Neutrosophic  
SuperHyperVertex-Decomposition. Two different types of SuperHyperDefinitions are debut  
for them but the research goes further and the SuperHyperNotion, SuperHyperUniform, and  
SuperHyperClass based on that are well-defined and well-reviewed. The literature review is  
implemented in the whole of this research. For shining the elegance and the significancy of this  
research, the comparison between this SuperHyperNotion with other SuperHyperNotions and  
fundamental SuperHyperNumbers are featured. The definitions are followed by the examples  
and the instances thus the clarifications are driven with different tools. The applications are  
figured out to make sense about the theoretical aspect of this ongoing research. The “Cancer’s  
Recognition” are the under research to figure out the challenges make sense about ongoing and  
upcoming research. The special case is up. The cells are viewed in the deemed ways. There are  
different types of them. Some of them are individuals and some of them are well-modeled by  
the group of cells. These types are all officially called “SuperHyperVertex” but the relations  
amid them all officially called “SuperHyperEdge”. The frameworks “SuperHyperGraph” and  
“Neutrosophic SuperHyperGraph” are chosen and elected to research about “Cancer’s Recognition”.  
Thus these complex and dense SuperHyperModels open up some avenues to research  
on theoretical segments and “Cancer’s Recognition”. Some avenues are posed to pursue this  
research. It’s also officially collected in the form of some questions and some problems. Assume  
a SuperHyperGraph. Assume a SuperHyperGraph. Then  $\delta$ -SuperHyperVertex-Decomposition  
is a maximal of SuperHyperVertices with a maximum cardinality such that either of the  
following expressions hold for the (Neutrosophic) cardinalities of SuperHyperNeighbors of  
 $s \in S$  : there are  $|S \cap N(s)| > |S \cap (V \setminus N(s))| + \delta$ ; and  $|S \cap N(s)| < |S \cap (V \setminus N(s))| + \delta$ . The  
first Expression, holds if  $S$  is an  $\delta$ -SuperHyperOffensive. And the second Expression, holds  
if  $S$  is an  $\delta$ -SuperHyperDefensive; a Neutrosophic  $\delta$ -SuperHyperVertex-Decomposition is  
a maximal Neutrosophic of SuperHyperVertices with maximum Neutrosophic cardinality  
such that either of the following expressions hold for the Neutrosophic cardinalities of Super-  
HyperNeighbors of  $s \in S$  there are:  $|S \cap N(s)|_{Neutrosophic} > |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta$ ;  
and  $|S \cap N(s)|_{Neutrosophic} < |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta$ . The first Expression, holds  
if  $S$  is a Neutrosophic  $\delta$ -SuperHyperOffensive. And the second Expression, holds if  $S$  is  
a Neutrosophic  $\delta$ -SuperHyperDefensive It’s useful to define a “Neutrosophic” version of

a SuperHyperVertex-Decomposition . Since there's more ways to get type-results to make  
a SuperHyperVertex-Decomposition more understandable. For the sake of having Neut-  
rosophic SuperHyperVertex-Decomposition, there's a need to "redefine" the notion of a  
"SuperHyperVertex-Decomposition ". The SuperHyperVertices and the SuperHyperEdges are  
assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of  
the position of labels to assign to the values. Assume a SuperHyperVertex-Decomposition .  
It's redefined a Neutrosophic SuperHyperVertex-Decomposition if the mentioned Table holds,  
concerning, "The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges  
Belong to The Neutrosophic SuperHyperGraph" with the key points, "The Values of The  
Vertices & The Number of Position in Alphabet", "The Values of The SuperVertices&The  
maximum Values of Its Vertices", "The Values of The Edges&The maximum Values of Its  
Vertices", "The Values of The HyperEdges&The maximum Values of Its Vertices", "The  
Values of The SuperHyperEdges&The maximum Values of Its Endpoints". To get structural  
examples and instances, I'm going to introduce the next SuperHyperClass of SuperHyperGraph  
based on a SuperHyperVertex-Decomposition . It's the main. It'll be disciplinary to have  
the foundation of previous definition in the kind of SuperHyperClass. If there's a need  
to have all SuperHyperVertex-Decomposition until the SuperHyperVertex-Decomposition,  
then it's officially called a "SuperHyperVertex-Decomposition" but otherwise, it isn't a  
SuperHyperVertex-Decomposition . There are some instances about the clarifications for the  
main definition titled a "SuperHyperVertex-Decomposition ". These two examples get more  
scrutiny and discernment since there are characterized in the disciplinary ways of the SuperHy-  
perClass based on a SuperHyperVertex-Decomposition . For the sake of having a Neutrosophic  
SuperHyperVertex-Decomposition, there's a need to "redefine" the notion of a "Neutrosophic  
SuperHyperVertex-Decomposition" and a "Neutrosophic SuperHyperVertex-Decomposition ".  
The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of  
the alphabets. In this procedure, there's the usage of the position of labels to assign to the values.  
Assume a Neutrosophic SuperHyperGraph. It's redefined "Neutrosophic SuperHyperGraph" if  
the intended Table holds. And a SuperHyperVertex-Decomposition are redefined to a "Neut-  
rosophic SuperHyperVertex-Decomposition" if the intended Table holds. It's useful to define  
"Neutrosophic" version of SuperHyperClasses. Since there's more ways to get Neutrosophic  
type-results to make a Neutrosophic SuperHyperVertex-Decomposition more understandable.  
Assume a Neutrosophic SuperHyperGraph. There are some Neutrosophic SuperHyperClasses  
if the intended Table holds. Thus SuperHyperPath, SuperHyperVertex-Decomposition,  
SuperHyperStar, SuperHyperBipartite, SuperHyperMultiPartite, and SuperHyperWheel,  
are "Neutrosophic SuperHyperPath", "Neutrosophic SuperHyperVertex-Decomposition",  
"Neutrosophic SuperHyperStar", "Neutrosophic SuperHyperBipartite", "Neutrosophic Super-  
HyperMultiPartite", and "Neutrosophic SuperHyperWheel" if the intended Table holds. A  
SuperHyperGraph has a "Neutrosophic SuperHyperVertex-Decomposition" where it's the  
strongest [the maximum Neutrosophic value from all the SuperHyperVertex-Decomposition  
amid the maximum value amid all SuperHyperVertices from a SuperHyperVertex-Decomposition  
.] SuperHyperVertex-Decomposition . A graph is a SuperHyperUniform if it's a SuperHyper-  
Graph and the number of elements of SuperHyperEdges are the same. Assume a Neutrosophic  
SuperHyperGraph. There are some SuperHyperClasses as follows. It's SuperHyperPath if it's  
only one SuperVertex as intersection amid two given SuperHyperEdges with two exceptions;  
it's SuperHyperVertex-Decomposition if it's only one SuperVertex as intersection amid two  
given SuperHyperEdges; it's SuperHyperStar it's only one SuperVertex as intersection amid

all SuperHyperEdges; it's SuperHyperBipartite it's only one SuperVertex as intersection  
 amid two given SuperHyperEdges and these SuperVertices, forming two separate sets, has  
 no SuperHyperEdge in common; it's SuperHyperMultiPartite it's only one SuperVertex as  
 intersection amid two given SuperHyperEdges and these SuperVertices, forming multi separate  
 sets, has no SuperHyperEdge in common; it's a SuperHyperWheel if it's only one SuperVertex  
 as intersection amid two given SuperHyperEdges and one SuperVertex has one SuperHyperEdge  
 with any common SuperVertex. The SuperHyperModel proposes the specific designs and  
 the specific architectures. The SuperHyperModel is officially called "SuperHyperGraph" and  
 "Neutrosophic SuperHyperGraph". In this SuperHyperModel, The "specific" cells and "specific  
 group" of cells are SuperHyperModeled as "SuperHyperVertices" and the common and intended  
 properties between "specific" cells and "specific group" of cells are SuperHyperModeled as  
 "SuperHyperEdges". Sometimes, it's useful to have some degrees of determinacy, indeterminacy,  
 and neutrality to have more precise SuperHyperModel which in this case the SuperHyperModel  
 is called "Neutrosophic". In the future research, the foundation will be based on the "Cancer's  
 Recognition" and the results and the definitions will be introduced in redeemed ways. The  
 recognition of the cancer in the long-term function. The specific region has been assigned  
 by the model [it's called SuperHyperGraph] and the long cycle of the move from the cancer  
 is identified by this research. Sometimes the move of the cancer hasn't be easily identified  
 since there are some determinacy, indeterminacy and neutrality about the moves and the  
 effects of the cancer on that region; this event leads us to choose another model [it's said  
 to be Neutrosophic SuperHyperGraph] to have convenient perception on what's happened  
 and what's done. There are some specific models, which are well-known and they've got the  
 names, and some SuperHyperGeneral SuperHyperModels. The moves and the traces of the  
 cancer on the complex tracks and between complicated groups of cells could be fantasized by a  
 Neutrosophic SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, Super-  
 HyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the  
 longest SuperHyperVertex-Decomposition or the strongest SuperHyperVertex-Decomposition  
 in those Neutrosophic SuperHyperModels. For the longest SuperHyperVertex-Decomposition,  
 called SuperHyperVertex-Decomposition, and the strongest SuperHyperVertex-Decomposition,  
 called Neutrosophic SuperHyperVertex-Decomposition, some general results are introduced.  
 Beyond that in SuperHyperStar, all possible SuperHyperPaths have only two SuperHyperEdges  
 but it's not enough since it's essential to have at least three SuperHyperEdges to form any style  
 of a SuperHyperVertex-Decomposition. There isn't any formation of any SuperHyperVertex-  
 Decomposition but literarily, it's the deformation of any SuperHyperVertex-Decomposition. It,  
 literarily, deforms and it doesn't form. A basic familiarity with Neutrosophic SuperHyperVertex-  
 Decomposition theory, SuperHyperGraphs, and Neutrosophic SuperHyperGraphs theory are  
 proposed.

**Keywords:** Neutrosophic SuperHyperGraph, SuperHyperVertex-Decomposition, Cancer's

Neutrosophic Recognition

**AMS Subject Classification:** 05C17, 05C22, 05E45





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## Applied Notions Under The Scrutiny Of The Motivation Of This Scientific Research

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In this scientific research, there are some ideas in the featured frameworks of motivations. I  
try to bring the motivations in the narrative ways. Some cells have been faced with some  
attacks from the situation which is caused by the cancer's attacks. In this case, there are  
some embedded analysis on the ongoing situations which in that, the cells could be labelled  
as some groups and some groups or individuals have excessive labels which all are raised from  
the behaviors to overcome the cancer's attacks. In the embedded situations, the individuals  
of cells and the groups of cells could be considered as "new groups". Thus it motivates us to  
find the proper SuperHyperModels for getting more proper analysis on this messy story. I've  
found the SuperHyperModels which are officially called "SuperHyperGraphs" and "Neutrosophic  
SuperHyperGraphs". In this SuperHyperModel, the cells and the groups of cells are defined as  
"SuperHyperVertices" and the relations between the individuals of cells and the groups of cells  
are defined as "SuperHyperEdges". Thus it's another motivation for us to do research on this  
SuperHyperModel based on the "Cancer's Recognition". Sometimes, the situations get worst.  
The situation is passed from the certainty and precise style. Thus it's the beyond them. There  
are three descriptions, namely, the degrees of determinacy, indeterminacy and neutrality, for any  
object based on vague forms, namely, incomplete data, imprecise data, and uncertain analysis.  
The latter model could be considered on the previous SuperHyperModel. It's SuperHyperModel.  
It's SuperHyperGraph but it's officially called "Neutrosophic SuperHyperGraphs". The cancer  
is the disease but the model is going to figure out what's going on this phenomenon. The special  
case of this disease is considered and as the consequences of the model, some parameters are used.  
The cells are under attack of this disease but the moves of the cancer in the special region are the  
matter of mind. The recognition of the cancer could help to find some treatments for this disease.  
The SuperHyperGraph and Neutrosophic SuperHyperGraph are the SuperHyperModels on the  
"Cancer's Recognition" and both bases are the background of this research. Sometimes the  
cancer has been happened on the region, full of cells, groups of cells and embedded styles. In this  
segment, the SuperHyperModel proposes some SuperHyperNotions based on the connectivities of  
the moves of the cancer in the forms of alliances' styles with the formation of the design and the  
architecture are formally called " SuperHyperVertex-Decomposition" in the themes of jargons  
and buzzwords. The prefix "SuperHyper" refers to the theme of the embedded styles to figure

out the background for the SuperHyperNotions. The recognition of the cancer in the long-term 4748  
function. The specific region has been assigned by the model [it's called SuperHyperGraph] 4749  
and the long cycle of the move from the cancer is identified by this research. Sometimes the 4750  
move of the cancer hasn't be easily identified since there are some determinacy, indeterminacy 4751  
and neutrality about the moves and the effects of the cancer on that region; this event leads us 4752  
to choose another model [it's said to be Neutrosophic SuperHyperGraph] to have convenient 4753  
perception on what's happened and what's done. There are some specific models, which are 4754  
well-known and they've got the names, and some general models. The moves and the traces of 4755  
the cancer on the complex tracks and between complicated groups of cells could be fantasized 4756  
by a Neutrosophic SuperHyperPath (-/SuperHyperVertex-Decomposition, SuperHyperStar, 4757  
SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find 4758  
either the optimal SuperHyperVertex-Decomposition or the Neutrosophic SuperHyperVertex- 4759  
Decomposition in those Neutrosophic SuperHyperModels. Some general results are introduced. 4760  
Beyond that in SuperHyperStar, all possible Neutrosophic SuperHyperPath s have only two 4761  
SuperHyperEdges but it's not enough since it's essential to have at least three SuperHyperEdges 4762  
to form any style of a SuperHyperVertex-Decomposition. There isn't any formation of any 4763  
SuperHyperVertex-Decomposition but literarily, it's the deformation of any SuperHyperVertex- 4764  
Decomposition. It, literarily, deforms and it doesn't form. 4765

**Question 28.0.1.** *How to define the SuperHyperNotions and to do research on them to find the 4766  
“amount of SuperHyperVertex-Decomposition” of either individual of cells or the groups of cells 4767  
based on the fixed cell or the fixed group of cells, extensively, the “amount of SuperHyperVertex- 4768  
Decomposition” based on the fixed groups of cells or the fixed groups of group of cells?* 4769

**Question 28.0.2.** *What are the best descriptions for the “Cancer's Recognition” in terms of 4770  
these messy and dense SuperHyperModels where embedded notions are illustrated?* 4771

It's motivation to find notions to use in this dense model is titled “SuperHyperGraphs”. 4772  
Thus it motivates us to define different types of “ SuperHyperVertex-Decomposition” and 4773  
“Neutrosophic SuperHyperVertex-Decomposition” on “SuperHyperGraph” and “Neutrosophic 4774  
SuperHyperGraph”. Then the research has taken more motivations to define SuperHyperClasses 4775  
and to find some connections amid this SuperHyperNotion with other SuperHyperNotions. It 4776  
motivates us to get some instances and examples to make clarifications about the framework of 4777  
this research. The general results and some results about some connections are some avenues to 4778  
make key point of this research, “Cancer's Recognition”, more understandable and more clear. 4779  
The framework of this research is as follows. In the beginning, I introduce basic definitions to 4780  
clarify about preliminaries. In the subsection “Preliminaries”, initial definitions about SuperHy- 4781  
perGraphs and Neutrosophic SuperHyperGraph are deeply-introduced and in-depth-discussed. 4782  
The elementary concepts are clarified and illustrated completely and sometimes review literature 4783  
are applied to make sense about what's going to figure out about the upcoming sections. The main 4784  
definitions and their clarifications alongside some results about new notions, SuperHyperVertex- 4785  
Decomposition and Neutrosophic SuperHyperVertex-Decomposition, are figured out in sections 4786  
“ SuperHyperVertex-Decomposition” and “Neutrosophic SuperHyperVertex-Decomposition”. In 4787  
the sense of tackling on getting results and in Vertex-Decomposition to make sense about con- 4788  
tinuing the research, the ideas of SuperHyperUniform and Neutrosophic SuperHyperUniform are 4789  
introduced and as their consequences, corresponded SuperHyperClasses are figured out to debut 4790  
what's done in this section, titled “Results on SuperHyperClasses” and “Results on Neutrosophic 4791  
SuperHyperClasses”. As going back to origin of the notions, there are some smart steps toward 4792

the common notions to extend the new notions in new frameworks, SuperHyperGraph and 4793  
Neutrosophic SuperHyperGraph, in the sections “Results on SuperHyperClasses” and “Results 4794  
on Neutrosophic SuperHyperClasses”. The starter research about the general SuperHyperRela- 4795  
tions and as concluding and closing section of theoretical research are contained in the section 4796  
“General Results”. Some general SuperHyperRelations are fundamental and they are well-known 4797  
as fundamental SuperHyperNotions as elicited and discussed in the sections, “General Results”, “ 4798  
SuperHyperVertex-Decomposition”, “Neutrosophic SuperHyperVertex-Decomposition”, “Results 4799  
on SuperHyperClasses” and “Results on Neutrosophic SuperHyperClasses”. There are curious 4800  
questions about what’s done about the SuperHyperNotions to make sense about excellency 4801  
of this research and going to figure out the word “best” as the description and adjective for 4802  
this research as presented in section, “ SuperHyperVertex-Decomposition”. The keyword of 4803  
this research debut in the section “Applications in Cancer’s Recognition” with two cases and 4804  
subsections “Case 1: The Initial Steps Toward SuperHyperBipartite as SuperHyperModel” and 4805  
“Case 2: The Increasing Steps Toward SuperHyperMultipartite as SuperHyperModel”. In the 4806  
section, “Open Problems”, there are some scrutiny and discernment on what’s done and what’s 4807  
happened in this research in the terms of “questions” and “problems” to make sense to figure 4808  
out this research in featured style. The advantages and the limitations of this research alongside 4809  
about what’s done in this research to make sense and to get sense about what’s figured out are 4810  
included in the section, “Conclusion and Closing Remarks”. 4811



# Neutrosophic Preliminaries Of This Scientific Research On the Redeemed Ways

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In this section, the basic material in this scientific research, is referred to [Single Valued Neutrosophic Set](Ref.[HG38],Definition 2.2,p.2), [Neutrosophic Set](Ref.[HG38],Definition 2.1,p.1), [Neutrosophic SuperHyperGraph (NSHG)](Ref.[HG38],Definition 2.5,p.2), [Characterization of the Neutrosophic SuperHyperGraph (NSHG)](Ref.[HG38],Definition 2.7,p.3), [t-norm](Ref.[HG38], Definition 2.7, p.3), and [Characterization of the Neutrosophic SuperHyperGraph (NSHG)](Ref.[HG38],Definition 2.7,p.3), [Neutrosophic Strength of the Neutrosophic SuperHyperPaths] (Ref.[HG38],Definition 5.3,p.7), and [Different Neutrosophic Types of Neutrosophic SuperHyperEdges (NSHE)] (Ref.[HG38],Definition 5.4,p.7). Also, the new ideas and their clarifications are addressed to Ref.[HG38].

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In this subsection, the basic material which is used in this scientific research, is presented. Also, the new ideas and their clarifications are elicited.

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**Definition 29.0.1** (Neutrosophic Set). (Ref.[HG38],Definition 2.1,p.1).

Let  $X$  be a Vertex-Decomposition of points (objects) with generic elements in  $X$  denoted by  $x$ ; then the **Neutrosophic set**  $A$  (NS  $A$ ) is an object having the form

$$A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}$$

where the functions  $T, I, F : X \rightarrow ]-0, 1^+[$  define respectively the a **truth-membership function**, an **indeterminacy-membership function**, and a **falsity-membership function** of the element  $x \in X$  to the set  $A$  with the condition

$$-0 \leq T_A(x) + I_A(x) + F_A(x) \leq 3^+.$$

The functions  $T_A(x), I_A(x)$  and  $F_A(x)$  are real standard or nonstandard subsets of  $]-0, 1^+[$ .

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**Definition 29.0.2** (Single Valued Neutrosophic Set). (Ref.[HG38],Definition 2.2,p.2).

Let  $X$  be a Vertex-Decomposition of points (objects) with generic elements in  $X$  denoted by  $x$ . A **single valued Neutrosophic set**  $A$  (SVNS  $A$ ) is characterized by truth-membership function  $T_A(x)$ , an indeterminacy-membership function  $I_A(x)$ , and a falsity-membership function  $F_A(x)$ . For each point  $x$  in  $X$ ,  $T_A(x), I_A(x), F_A(x) \in [0, 1]$ . A SVNS  $A$  can be written as

$$A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}.$$

**Definition 29.0.3.** The **degree of truth-membership, indeterminacy-membership** and **falsity-membership of the subset**  $X \subset A$  of the single valued Neutrosophic set  $A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$ :

$$T_A(X) = \min[T_A(v_i), T_A(v_j)]_{v_i, v_j \in X},$$

$$I_A(X) = \min[I_A(v_i), I_A(v_j)]_{v_i, v_j \in X},$$

$$\text{and } F_A(X) = \min[F_A(v_i), F_A(v_j)]_{v_i, v_j \in X}.$$

**Definition 29.0.4.** The **support** of  $X \subset A$  of the single valued Neutrosophic set  $A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$ :

$$\text{supp}(X) = \{x \in X : T_A(x), I_A(x), F_A(x) > 0\}.$$

**Definition 29.0.5** (Neutrosophic SuperHyperGraph (NSHG)). (**Ref.**[HG38], Definition 2.5, p.2). 4828  
Assume  $V'$  is a given set. a **Neutrosophic SuperHyperGraph** (NSHG)  $S$  is a pair  $S = (V, E)$ , 4829  
where 4830

- (i)  $V = \{V_1, V_2, \dots, V_n\}$  a finite set of finite single valued Neutrosophic subsets of  $V'$ ; 4831
- (ii)  $V = \{(V_i, T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i)) : T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i) \geq 0\}$ ,  $(i = 1, 2, \dots, n)$ ; 4832
- (iii)  $E = \{E_1, E_2, \dots, E_{n'}\}$  a finite set of finite single valued Neutrosophic subsets of  $V$ ; 4833
- (iv)  $E = \{(E_{i'}, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'})) : T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}) \geq 0\}$ ,  $(i' = 1, 2, \dots, n')$ ; 4834  
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- (v)  $V_i \neq \emptyset$ ,  $(i = 1, 2, \dots, n)$ ; 4836
- (vi)  $E_{i'} \neq \emptyset$ ,  $(i' = 1, 2, \dots, n')$ ; 4837
- (vii)  $\sum_i \text{supp}(V_i) = V$ ,  $(i = 1, 2, \dots, n)$ ; 4838
- (viii)  $\sum_{i'} \text{supp}(E_{i'}) = V$ ,  $(i' = 1, 2, \dots, n')$ ; 4839
- (ix) and the following conditions hold:

$$T'_V(E_{i'}) \leq \min[T_{V'}(V_i), T_{V'}(V_j)]_{V_i, V_j \in E_{i'}},$$

$$I'_V(E_{i'}) \leq \min[I_{V'}(V_i), I_{V'}(V_j)]_{V_i, V_j \in E_{i'}},$$

$$\text{and } F'_V(E_{i'}) \leq \min[F_{V'}(V_i), F_{V'}(V_j)]_{V_i, V_j \in E_{i'}}$$

where  $i' = 1, 2, \dots, n'$ . 4840

Here the Neutrosophic SuperHyperEdges (NSHE)  $E_{j'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_j$  are single valued Neutrosophic sets.  $T_{V'}(V_i)$ ,  $I_{V'}(V_i)$ , and  $F_{V'}(V_i)$  denote the 4841  
degree of truth-membership, the degree of indeterminacy-membership and the degree of 4842  
falsity-membership the Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to the Neutrosophic 4843  
SuperHyperVertex (NSHV)  $V$ .  $T'_V(E_{i'})$ ,  $I'_V(E_{i'})$ , and  $F'_V(E_{i'})$  denote the degree of truth- 4844  
membership, the degree of indeterminacy-membership and the degree of falsity-membership of 4845  
the Neutrosophic SuperHyperEdge (NSHE)  $E_{i'}$  to the Neutrosophic SuperHyperEdge (NSHE) 4846  
 $E$ . Thus, the  $ii'$ th element of the **incidence matrix** of Neutrosophic SuperHyperGraph (NSHG) 4847  
are of the form  $(V_i, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}))$ , the sets  $V$  and  $E$  are crisp sets. 4848  
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**Definition 29.0.6** (Characterization of the Neutrosophic SuperHyperGraph (NSHG)). (Ref.[HG38], Definition 2.7, p.3). 4850

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . The Neutrosophic SuperHyperEdges (NSHE)  $E_{i'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_i$  of Neutrosophic SuperHyperGraph (NSHG)  $S = (V, E)$  could be characterized as follow-up items. 4852

(i) If  $|V_i| = 1$ , then  $V_i$  is called **vertex**; 4855

(ii) if  $|V_i| \geq 1$ , then  $V_i$  is called **SuperVertex**; 4856

(iii) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **edge**; 4857

(iv) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **HyperEdge**; 4858

(v) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **SuperEdge**; 4859

(vi) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **SuperHyperEdge**. 4860

If we choose different types of binary operations, then we could get hugely diverse types of general forms of Neutrosophic SuperHyperGraph (NSHG). 4863

**Definition 29.0.7** (t-norm). (Ref.[HG38], Definition 2.7, p.3). 4865

A binary operation  $\otimes : [0, 1] \times [0, 1] \rightarrow [0, 1]$  is a **t-norm** if it satisfies the following for  $x, y, z, w \in [0, 1]$ : 4866

(i)  $1 \otimes x = x$ ; 4868

(ii)  $x \otimes y = y \otimes x$ ; 4869

(iii)  $x \otimes (y \otimes z) = (x \otimes y) \otimes z$ ; 4870

(iv) If  $w \leq x$  and  $y \leq z$  then  $w \otimes y \leq x \otimes z$ . 4871

**Definition 29.0.8.** The **degree of truth-membership, indeterminacy-membership and falsity-membership of the subset**  $X \subset A$  of the single valued Neutrosophic set  $A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}$  (with respect to t-norm  $T_{norm}$ ):

$$T_A(X) = T_{norm}[T_A(v_i), T_A(v_j)]_{v_i, v_j \in X},$$

$$I_A(X) = T_{norm}[I_A(v_i), I_A(v_j)]_{v_i, v_j \in X},$$

$$\text{and } F_A(X) = T_{norm}[F_A(v_i), F_A(v_j)]_{v_i, v_j \in X}.$$

**Definition 29.0.9.** The **support** of  $X \subset A$  of the single valued Neutrosophic set  $A = \{ \langle x : T_A(x), I_A(x), F_A(x) \rangle, x \in X \}$ :

$$\text{supp}(X) = \{x \in X : T_A(x), I_A(x), F_A(x) > 0\}.$$

**Definition 29.0.10.** (General Forms of Neutrosophic SuperHyperGraph (NSHG)). 4872

Assume  $V'$  is a given set. a **Neutrosophic SuperHyperGraph** (NSHG)  $S$  is a pair  $S = (V, E)$ , where 4873



- (i)  $V = \{V_1, V_2, \dots, V_n\}$  a finite set of finite single valued Neutrosophic subsets of  $V'$ ; 4875
- (ii)  $V = \{(V_i, T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i)) : T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i) \geq 0\}$ ,  $(i = 1, 2, \dots, n)$ ; 4876
- (iii)  $E = \{E_1, E_2, \dots, E_{n'}\}$  a finite set of finite single valued Neutrosophic subsets of  $V$ ; 4877
- (iv)  $E = \{(E_{i'}, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'})) : T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}) \geq 0\}$ ,  $(i' = 1, 2, \dots, n')$ ; 4878  
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- (v)  $V_i \neq \emptyset$ ,  $(i = 1, 2, \dots, n)$ ; 4880
- (vi)  $E_{i'} \neq \emptyset$ ,  $(i' = 1, 2, \dots, n')$ ; 4881
- (vii)  $\sum_i \text{supp}(V_i) = V$ ,  $(i = 1, 2, \dots, n)$ ; 4882
- (viii)  $\sum_{i'} \text{supp}(E_{i'}) = V$ ,  $(i' = 1, 2, \dots, n')$ . 4883

Here the Neutrosophic SuperHyperEdges (NSHE)  $E_{j'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_j$  are single valued Neutrosophic sets.  $T_{V'}(V_i)$ ,  $I_{V'}(V_i)$ , and  $F_{V'}(V_i)$  denote the degree of truth-membership, the degree of indeterminacy-membership and the degree of falsity-membership the Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to the Neutrosophic SuperHyperVertex (NSHV)  $V$ .  $T'_V(E_{i'})$ ,  $I'_V(E_{i'})$ , and  $F'_V(E_{i'})$  denote the degree of truth-membership, the degree of indeterminacy-membership and the degree of falsity-membership of the Neutrosophic SuperHyperEdge (NSHE)  $E_{i'}$  to the Neutrosophic SuperHyperEdge (NSHE)  $E$ . Thus, the  $ii'$ 'th element of the **incidence matrix** of Neutrosophic SuperHyperGraph (NSHG) are of the form  $(V_i, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}))$ , the sets  $V$  and  $E$  are crisp sets. 4884  
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**Definition 29.0.11** (Characterization of the Neutrosophic SuperHyperGraph (NSHG)). 4893  
(Ref.[HG38], Definition 2.7,p.3). 4894

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . The Neutrosophic SuperHyperEdges (NSHE)  $E_{i'}$  and the Neutrosophic SuperHyperVertices (NSHV)  $V_i$  of Neutrosophic SuperHyperGraph (NSHG)  $S = (V, E)$  could be characterized as follow-up items. 4895  
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- (i) If  $|V_i| = 1$ , then  $V_i$  is called **vertex**; 4898
- (ii) if  $|V_i| \geq 1$ , then  $V_i$  is called **SuperVertex**; 4899
- (iii) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **edge**; 4900
- (iv) if for all  $V_i$ s are incident in  $E_{i'}$ ,  $|V_i| = 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **HyperEdge**; 4901
- (v) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| = 2$ , then  $E_{i'}$  is called **SuperEdge**; 4902  
4903
- (vi) if there's a  $V_i$  is incident in  $E_{i'}$  such that  $|V_i| \geq 1$ , and  $|E_{i'}| \geq 2$ , then  $E_{i'}$  is called **SuperHyperEdge**. 4904  
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This SuperHyperModel is too messy and too dense. Thus there's a need to have some restrictions and conditions on SuperHyperGraph. The special case of this SuperHyperGraph makes the patterns and regularities. 4906  
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**Definition 29.0.12.** A graph is **SuperHyperUniform** if it's SuperHyperGraph and the number of elements of SuperHyperEdges are the same. 4909  
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To get more visions on SuperHyperUniform, the some SuperHyperClasses are introduced. It makes to have SuperHyperUniform more understandable.

**Definition 29.0.13.** Assume a Neutrosophic SuperHyperGraph. There are some SuperHyperClasses as follows.

- (i). It's **Neutrosophic SuperHyperPath** if it's only one SuperVertex as intersection amid two given SuperHyperEdges with two exceptions;
- (ii). it's **SuperHyperCycle** if it's only one SuperVertex as intersection amid two given SuperHyperEdges;
- (iii). it's **SuperHyperStar** it's only one SuperVertex as intersection amid all SuperHyperEdges;
- (iv). it's **SuperHyperBipartite** it's only one SuperVertex as intersection amid two given SuperHyperEdges and these SuperVertices, forming two separate sets, has no SuperHyperEdge in common;
- (v). it's **SuperHyperMultiPartite** it's only one SuperVertex as intersection amid two given SuperHyperEdges and these SuperVertices, forming multi separate sets, has no SuperHyperEdge in common;
- (vi). it's **SuperHyperWheel** if it's only one SuperVertex as intersection amid two given SuperHyperEdges and one SuperVertex has one SuperHyperEdge with any common SuperVertex.

**Definition 29.0.14.** Let a pair  $S = (V, E)$  be a Neutrosophic SuperHyperGraph (NSHG)  $S$ . Then a sequence of Neutrosophic SuperHyperVertices (NSHV) and Neutrosophic SuperHyperEdges (NSHE)

$$V_1, E_1, V_2, E_2, V_3, \dots, V_{s-1}, E_{s-1}, V_s$$

is called a **Neutrosophic SuperHyperPath** (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_1$  to Neutrosophic SuperHyperVertex (NSHV)  $V_s$  if either of following conditions hold:

- (i)  $V_i, V_{i+1} \in E_{i'}$ ;
- (ii) there's a vertex  $v_i \in V_i$  such that  $v_i, V_{i+1} \in E_{i'}$ ;
- (iii) there's a SuperVertex  $V'_i \in V_i$  such that  $V'_i, V_{i+1} \in E_{i'}$ ;
- (iv) there's a vertex  $v_{i+1} \in V_{i+1}$  such that  $V_i, v_{i+1} \in E_{i'}$ ;
- (v) there's a SuperVertex  $V'_{i+1} \in V_{i+1}$  such that  $V_i, V'_{i+1} \in E_{i'}$ ;
- (vi) there are a vertex  $v_i \in V_i$  and a vertex  $v_{i+1} \in V_{i+1}$  such that  $v_i, v_{i+1} \in E_{i'}$ ;
- (vii) there are a vertex  $v_i \in V_i$  and a SuperVertex  $V'_{i+1} \in V_{i+1}$  such that  $v_i, V'_{i+1} \in E_{i'}$ ;
- (viii) there are a SuperVertex  $V'_i \in V_i$  and a vertex  $v_{i+1} \in V_{i+1}$  such that  $V'_i, v_{i+1} \in E_{i'}$ ;
- (ix) there are a SuperVertex  $V'_i \in V_i$  and a SuperVertex  $V'_{i+1} \in V_{i+1}$  such that  $V'_i, V'_{i+1} \in E_{i'}$ .

**Definition 29.0.15.** (Characterization of the Neutrosophic SuperHyperPaths).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . a Neutrosophic SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_1$  to Neutrosophic SuperHyperVertex (NSHV)  $V_s$  is sequence of Neutrosophic SuperHyperVertices (NSHV) and Neutrosophic SuperHyperEdges (NSHE)

$$V_1, E_1, V_2, E_2, V_3, \dots, V_{s-1}, E_{s-1}, V_s,$$

could be characterized as follow-up items.

- (i) If for all  $V_i, E_{j'}$ ,  $|V_i| = 1$ ,  $|E_{j'}| = 2$ , then NSHP is called **path**;
- (ii) if for all  $E_{j'}$ ,  $|E_{j'}| = 2$ , and there's  $V_i$ ,  $|V_i| \geq 1$ , then NSHP is called **SuperPath**;
- (iii) if for all  $V_i, E_{j'}$ ,  $|V_i| = 1$ ,  $|E_{j'}| \geq 2$ , then NSHP is called **HyperPath**;
- (iv) if there are  $V_i, E_{j'}$ ,  $|V_i| \geq 1$ ,  $|E_{j'}| \geq 2$ , then NSHP is called **Neutrosophic SuperHyperPath**.

**Definition 29.0.16** (Neutrosophic Strength of the Neutrosophic SuperHyperPaths). (Ref.[HG38], Definition 5.3,p.7).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . A Neutrosophic SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_1$  to Neutrosophic SuperHyperVertex (NSHV)  $V_s$  is sequence of Neutrosophic SuperHyperVertices (NSHV) and Neutrosophic SuperHyperEdges (NSHE)

$$V_1, E_1, V_2, E_2, V_3, \dots, V_{s-1}, E_{s-1}, V_s,$$

have

- (i) **Neutrosophic t-strength**  $(\min\{T(V_i)\}, m, n)_{i=1}^s$ ;
- (ii) **Neutrosophic i-strength**  $(m, \min\{I(V_i)\}, n)_{i=1}^s$ ;
- (iii) **Neutrosophic f-strength**  $(m, n, \min\{F(V_i)\})_{i=1}^s$ ;
- (iv) **Neutrosophic strength**  $(\min\{T(V_i)\}, \min\{I(V_i)\}, \min\{F(V_i)\})_{i=1}^s$ .

**Definition 29.0.17** (Different Neutrosophic Types of Neutrosophic SuperHyperEdges (NSHE)). (Ref.[HG38], Definition 5.4,p.7).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called

- (ix) **Neutrosophic t-connective** if  $T(E) \geq$  maximum number of Neutrosophic t-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ ;
- (x) **Neutrosophic i-connective** if  $I(E) \geq$  maximum number of Neutrosophic i-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ ;

(xi) **Neutrosophic f-connective** if  $F(E) \geq$  maximum number of Neutrosophic f-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ ;

(xii) **Neutrosophic connective** if  $(T(E), I(E), F(E)) \geq$  maximum number of Neutrosophic strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)  $V_i$  to Neutrosophic SuperHyperVertex (NSHV)  $V_j$  where  $1 \leq i, j \leq s$ .

**Definition 29.0.18.** (Different Neutrosophic Types of Neutrosophic SuperHyperVertex-Decomposition).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called

(i) **Neutrosophic e-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic e-SuperHyperVertex-Decomposition criteria** holds

$$\forall E' : E' \text{ is disconnect-able};$$

(ii) **Neutrosophic re-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic re-SuperHyperVertex-Decomposition criteria** holds

$$\forall E' : E' \text{ is disconnect-able};$$

$$\text{and } |E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}};$$

(iii) **Neutrosophic v-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic v-SuperHyperVertex-Decomposition criteria** holds

$$\forall V' : V' \text{ is disconnect-able};$$

(iv) **Neutrosophic rv-SuperHyperVertex-Decomposition** if the following expression is called **Neutrosophic v-SuperHyperVertex-Decomposition criteria** holds

$$\forall V' : V' \text{ is disconnect-able};$$

$$\text{and } |V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}};$$

(v) **Neutrosophic SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition.

**Definition 29.0.19.** ((Neutrosophic) SuperHyperVertex-Decomposition).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called

- (i) an **Extreme SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; 4989-4996
- (ii) a **Neutrosophic SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; 4997-5004
- (iii) an **Extreme SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; and the Extreme power is corresponded to its Extreme coefficient; 5005-5014
- (iv) a **Neutrosophic SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic power is corresponded to its Neutrosophic coefficient; 5015-5025
- (v) an **Extreme V-SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive 5026-5031

Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; 5032  
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(vi) a **Neutrosophic V-SuperHyperVertex-Decomposition** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; 5034  
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(vii) an **Extreme V-SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperVertex-Decomposition; and the Extreme power is corresponded to its Extreme coefficient; 5042  
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(viii) a **Neutrosophic SuperHyperVertex-Decomposition SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperVertex-Decomposition, Neutrosophic re-SuperHyperVertex-Decomposition, Neutrosophic v-SuperHyperVertex-Decomposition, and Neutrosophic rv-SuperHyperVertex-Decomposition and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperVertex-Decomposition; and the Neutrosophic power is corresponded to its Neutrosophic coefficient. 5052  
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**Definition 29.0.20.** ((Extreme/Neutrosophic) $\delta$ –SuperHyperVertex-Decomposition). 5063

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Then 5064

(i) an  $\delta$ –**SuperHyperVertex-Decomposition** is a Neutrosophic kind of Neutrosophic SuperHyperVertex-Decomposition such that either of the following expressions hold for the Neutrosophic cardinalities of SuperHyperNeighbors of  $s \in S$  : 5065  
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$$\begin{aligned} |S \cap N(s)| &> |S \cap (V \setminus N(s))| + \delta; & \boxed{136EQN1} \\ |S \cap N(s)| &< |S \cap (V \setminus N(s))| + \delta. & \boxed{136EQN2} \end{aligned}$$

The Expression (29.1), holds if  $S$  is an  $\delta$ –**SuperHyperOffensive**. And the Expression (29.1), holds if  $S$  is an  $\delta$ –**SuperHyperDefensive**; 5068  
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Table 29.1: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph Mentioned in the Definition (29.0.23)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

136TBL3

- (ii) a **Neutrosophic  $\delta$ -SuperHyperVertex-Decomposition** is a Neutrosophic kind of Neutrosophic SuperHyperVertex-Decomposition such that either of the following Neutrosophic expressions hold for the Neutrosophic cardinalities of SuperHyperNeighbors of  $s \in S$  :

$$|S \cap N(s)|_{Neutrosophic} > |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta; \quad 136EQN3$$

$$|S \cap N(s)|_{Neutrosophic} < |S \cap (V \setminus N(s))|_{Neutrosophic} + \delta. \quad 136EQN4$$

The Expression (29.1), holds if  $S$  is a **Neutrosophic  $\delta$ -SuperHyperOffensive**. And the Expression (29.1), holds if  $S$  is a **Neutrosophic  $\delta$ -SuperHyperDefensive**.

For the sake of having a Neutrosophic SuperHyperVertex-Decomposition, there's a need to “redefine” the notion of “Neutrosophic SuperHyperGraph”. The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of the position of labels to assign to the values.

136DEF1

**Definition 29.0.21.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . It's redefined **Neutrosophic SuperHyperGraph** if the Table (29.1) holds.

It's useful to define a “Neutrosophic” version of SuperHyperClasses. Since there's more ways to get Neutrosophic type-results to make a Neutrosophic more understandable.

136DEF2

**Definition 29.0.22.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . There are some **Neutrosophic SuperHyperClasses** if the Table (29.2) holds. Thus Neutrosophic SuperHyperPath, SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultiPartite, and SuperHyperWheel, are **Neutrosophic SuperHyperPath, Neutrosophic SuperHyperCycle, Neutrosophic SuperHyperStar, Neutrosophic SuperHyperBipartite, Neutrosophic SuperHyperMultiPartite, and Neutrosophic SuperHyperWheel** if the Table (29.2) holds.

It's useful to define a “Neutrosophic” version of a Neutrosophic SuperHyperVertex-Decomposition. Since there's more ways to get type-results to make a Neutrosophic SuperHyperVertex-Decomposition more Neutrosophicly understandable.

For the sake of having a Neutrosophic SuperHyperVertex-Decomposition, there's a need to “redefine” the Neutrosophic notion of “Neutrosophic SuperHyperVertex-Decomposition”. The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of the alphabets. In this procedure, there's the usage of the position of labels to assign to the values.

Table 29.2: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges  
Belong to The Neutrosophic SuperHyperGraph, Mentioned in the Definition (29.0.22)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

136TBL4

Table 29.3: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges  
Belong to The Neutrosophic SuperHyperGraph Mentioned in the Definition (29.0.23)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

136TBL1

136DEF1

**Definition 29.0.23.** Assume a SuperHyperVertex-Decomposition. It's redefined a **Neutrosophic SuperHyperVertex-Decomposition** if the Table (29.3) holds. 5099 5100





# Neutrosophic SuperHyperVertex-Decomposition But As The Extensions Excerpt From Dense And Super Forms

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**Definition 30.0.1.** (Neutrosophic event).

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Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Any Neutrosophic  $k$ -subset of  $A$  of  $V$  is called **Neutrosophic  $k$ -event** and if  $k = 2$ , then Neutrosophic subset of  $A$  of  $V$  is called **Neutrosophic event**. The following expression is called **Neutrosophic probability** of  $A$ .

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$$E(A) = \sum_{a \in A} E(a). \quad (30.1)$$

**Definition 30.0.2.** (Neutrosophic Independent).

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Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition.  $s$  Neutrosophic  $k$ -events  $A_i$ ,  $i \in I$  is called **Neutrosophic  $s$ -independent** if the following expression is called **Neutrosophic  $s$ -independent criteria**

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$$E(\cap_{i \in I} A_i) = \prod_{i \in I} P(A_i).$$

And if  $s = 2$ , then Neutrosophic  $k$ -events of  $A$  and  $B$  is called **Neutrosophic independent**.

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The following expression is called **Neutrosophic independent criteria**

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$$E(A \cap B) = P(A)P(B). \quad (30.2)$$

**Definition 30.0.3.** (Neutrosophic Variable).

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Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Any  $k$ -function Vertex-Decomposition like  $E$  is called **Neutrosophic  $k$ -Variable**. If  $k = 2$ , then any 2-function Vertex-Decomposition like  $E$  is called **Neutrosophic Variable**.

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The notion of independent on Neutrosophic Variable is likewise.

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**Definition 30.0.4.** (Neutrosophic Expectation). 5123

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. A Neutrosophic k-Variable  $E$  has a number is called 5124  
**Neutrosophic Expectation** if the following expression is called **Neutrosophic Expectation** 5125  
**criteria** 5126 5127

$$Ex(E) = \sum_{\alpha \in V} E(\alpha)P(\alpha).$$

**Definition 30.0.5.** (Neutrosophic Crossing). 5128

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. A Neutrosophic number is called **Neutrosophic Crossing** 5129  
if the following expression is called **Neutrosophic Crossing criteria** 5130 5131

$$Cr(S) = \min\{\text{Number of Crossing in a Plane Embedding of } S\}.$$

**Lemma 30.0.6.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . 5132  
Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $m$  and  $n$  propose special 5133  
Vertex-Decomposition. Then with  $m \geq 4n$ , 5134

*Proof.* Consider a planar embedding  $G$  of  $G$  with  $cr(G)$  crossings. Let  $S$  be a Neutrosophic random k-subset of  $V$  obtained by choosing each SuperHyperVertex of  $G$  Neutrosophic independently with probability Vertex-Decomposition  $p := 4n/m$ , and set  $H := G[S]$  and  $H := G[S]$ .

Define random variables  $X, Y, Z$  on  $V$  as follows:  $X$  is the Neutrosophic number of SuperHyperVertices,  $Y$  the Neutrosophic number of SuperHyperEdges, and  $Z$  the Neutrosophic number of crossings of  $H$ . The trivial bound noted above, when applied to  $H$ , yields the inequality  $Z \geq cr(H) \geq Y - 3X$ . By linearity of Neutrosophic Expectation,

$$E(Z) \geq E(Y) - 3E(X).$$

Now  $E(X) = pn$ ,  $E(Y) = p^2m$  (each SuperHyperEdge having some SuperHyperEnds) and  $E(Z) = p^4cr(G)$  (each crossing being defined by some SuperHyperVertices). Hence

$$p^4cr(G) \geq p^2m - 3pn.$$

Dividing both sides by  $p^4$ , we have: 5135

$$cr(G) \geq \frac{pm - 3n}{p^3} = \frac{n}{(4n/m)^3} = \frac{1}{64}m^3n^2.$$

■ 5136

**Theorem 30.0.7.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . 5137  
Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $P$  be a SuperHyperSet of  $n$  5138  
points in the plane, and let  $l$  be the Neutrosophic number of SuperHyperLines in the plane 5139  
passing through at least  $k + 1$  of these points, where  $1 \leq k \leq 2\sqrt{2n}$ . Then  $l < 32n^2/k^3$ . 5140

*Proof.* Form a Neutrosophic SuperHyperGraph  $G$  with SuperHyperVertex SuperHyperSet  $P$  whose SuperHyperEdge are the segments between conseNeighborive points on the SuperHyperLines which pass through at least  $k + 1$  points of  $P$ . This Neutrosophic SuperHyperGraph has at least  $kl$  SuperHyperEdges and Neutrosophic crossing at most  $l$  choose two. Thus either  $kl < 4n$ , in which case  $l < 4n/k \leq 32n^2/k^3$ , or  $l^2/2 > 1$  choose  $2 \geq cr(G) \geq (kl)^3/64n^2$  by the Neutrosophic Crossing Lemma, and again  $l < 32n^2/k^3$ . ■

**Theorem 30.0.8.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $P$  be a SuperHyperSet of  $n$  points in the plane, and let  $k$  be the number of pairs of points of  $P$  at unit SuperHyperDistance. Then  $k < 5n^{4/3}$ .

*Proof.* Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Draw a SuperHyperUnit SuperHyperCircle around each SuperHyperPoint of  $P$ . Let  $n_i$  be the Neutrosophic number of these SuperHyperCircles passing through exactly  $i$  points of  $P$ . Then  $\sum i = 0^{n-1}n_i = n$  and  $k = \frac{1}{2} \sum i = 0^{n-1}in_i$ . Now form a Neutrosophic SuperHyperGraph  $H$  with SuperHyperVertex SuperHyperSet  $P$  whose SuperHyperEdges are the SuperHyperArcs between conseNeighborive SuperHyperPoints on the SuperHyperCircles that pass through at least three SuperHyperPoints of  $P$ . Then

$$e(H) = \sum_{i=3}^{n-1} in_i = 2k - n_1 - 2n_2 \geq 2k - 2n.$$

Some SuperHyperPairs of SuperHyperVertices of  $H$  might be joined by some parallel SuperHyperEdges. Delete from  $H$  one of each SuperHyperPair of parallel SuperHyperEdges, so as to obtain a simple Neutrosophic SuperHyperGraph  $G$  with  $e(G) \geq k - n$ . Now  $cr(G) \leq n(n - 1)$  because  $G$  is formed from at most  $n$  SuperHyperCircles, and any two SuperHyperCircles cross at most twice. Thus either  $e(G) < 4n$ , in which case  $k < 5n < 5n^{4/3}$ , or  $n^2 > n(n - 1) \geq cr(G) \geq (k - n)^3/64n^2$  by the Neutrosophic Crossing Lemma, and  $k < 4n^{4/3} + n < 5n^{4/3}$ . ■

**Proposition 30.0.9.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X$  be a nonnegative Neutrosophic Variable and  $t$  a positive real number. Then

$$P(X \geq t) \leq \frac{E(X)}{t}.$$

*Proof.*

$$\begin{aligned} E(X) &= \sum \{X(a)P(a) : a \in V\} \geq \sum \{X(a)P(a) : a \in V, X(a) \geq t\} \\ &= \sum \{tP(a) : a \in V, X(a) \geq t\} = t \sum \{P(a) : a \in V, X(a) \geq t\} \\ &= tP(X \geq t). \end{aligned}$$

Dividing the first and last members by  $t$  yields the asserted inequality. ■

**Corollary 30.0.10.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X_n$  be a nonnegative integer-valued variable in a probability Vertex-Decomposition  $(V_n, E_n), n \geq 1$ . If  $E(X_n) \rightarrow 0$  as  $n \rightarrow \infty$ , then  $P(X_n = 0) \rightarrow 1$  as  $n \rightarrow \infty$ .

*Proof.*

**Theorem 30.0.11.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. A special SuperHyperGraph in  $G_{n,p}$  almost surely has stability number at most  $\lceil 2p^{-1} \log n \rceil$ .

*Proof.* Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. A special SuperHyperGraph in  $G_{n,p}$  is up. Let  $G \in \mathcal{G}_{n,p}$  and let  $S$  be a given SuperHyperSet of  $k + 1$  SuperHyperVertices of  $G$ , where  $k \in \mathbb{N}$ . The probability that  $S$  is a stable SuperHyperSet of  $G$  is  $(1 - p)^{(k+1)\text{choose}2}$ , this being the probability that none of the  $(k + 1)\text{choose}2$  pairs of SuperHyperVertices of  $S$  is a SuperHyperEdge of the Neutrosophic SuperHyperGraph  $G$ . Let  $A_S$  denote the event that  $S$  is a stable SuperHyperSet of  $G$ , and let  $X_S$  denote the indicator Neutrosophic Variable for this Neutrosophic Event. By equation, we have

$$E(X_S) = P(X_S = 1) = P(A_S) = (1 - p)^{(k+1)\text{choose}2}.$$

Let  $X$  be the number of stable SuperHyperSets of cardinality  $k + 1$  in  $G$ . Then

$$X = \sum \{X_S : S \subseteq V, |S| = k + 1\}$$

and so, by those,

$$E(X) = \sum \{E(X_S) : S \subseteq V, |S| = k + 1\} = (n \text{ choose } k+1)(1 - p)^{(k+1)\text{choose}2}.$$

We bound the right-hand side by invoking two elementary inequalities:

$$(n \text{ choose } k+1) \leq \frac{n^{k+1}}{(k+1)!} \text{ and } 1 - p \leq e^{-p}.$$

This yields the following upper bound on  $E(X)$ .

$$E(X) \leq \frac{n^{k+1} e^{-p(k+1)\text{choose}2}}{(k+1)!} = \frac{ne^{-pk/2k+1}}{(k+1)!}$$

Suppose now that  $k = \lceil 2p^{-1} \log n \rceil$ . Then  $k \geq 2p^{-1} \log n$ , so  $ne^{-pk/2} \leq 1$ . Because  $k$  grows at least as fast as the logarithm of  $n$ , implies that  $E(X) \rightarrow 0$  as  $n \rightarrow \infty$ . Because  $X$  is integer-valued and nonnegative, we deduce from Corollary that  $P(X = 0) \rightarrow 1$  as  $n \rightarrow \infty$ . Consequently, a Neutrosophic SuperHyperGraph in  $\mathcal{G}_{n,p}$  almost surely has stability number at most  $k$ .

**Definition 30.0.12.** (Neutrosophic Variance).

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. A Neutrosophic  $k$ -Variable  $E$  has a number is called **Neutrosophic Variance criteria** if the following expression is called **Neutrosophic Variance criteria**

$$Vx(E) = Ex((X - Ex(X))^2).$$

**Theorem 30.0.13.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X$  be a Neutrosophic Variable and let  $t$  be a positive real number. Then

$$E(|X - Ex(X)| \geq t) \leq \frac{V(X)}{t^2}.$$

*Proof.* Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X$  be a Neutrosophic Variable and let  $t$  be a positive real number. Then

$$E(|X - Ex(X)| \geq t) = E((X - Ex(X))^2 \geq t^2) \leq \frac{Ex((X - Ex(X))^2)}{t^2} = \frac{V(X)}{t^2}.$$

■ 5204

**Corollary 30.0.14.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $X_n$  be a Neutrosophic Variable in a probability Vertex-Decomposition  $(V_n, E_n)$ ,  $n \geq 1$ . If  $Ex(X_n) \neq 0$  and  $V(X_n) \ll E^2(X_n)$ , then

$$E(X_n = 0) \rightarrow 0 \text{ as } n \rightarrow \infty$$

*Proof.* Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Set  $X := X_n$  and  $t := |Ex(X_n)|$  in Chebyshev's Inequality, and observe that  $E(X_n = 0) \leq E(|X_n - Ex(X_n)| \geq |Ex(X_n)|)$  because  $|X_n - Ex(X_n)| = |Ex(X_n)|$  when  $X_n = 0$ .

■ 5212

**Theorem 30.0.15.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $G \in \mathcal{G}_{n,1/2}$ . For  $0 \leq k \leq n$ , set  $f(k) := (n \text{ choose } k)2^{-(k \text{ choose } 2)}$  and let  $k^*$  be the least value of  $k$  for which  $f(k)$  is less than one. Then almost surely  $\alpha(G)$  takes one of the three values  $k^* - 2, k^* - 1, k^*$ .

*Proof.* Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. As in the proof of related Theorem, the result is straightforward.

■ 5219

**Corollary 30.0.16.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $G \in \mathcal{G}_{n,1/2}$  and let  $f$  and  $k^*$  be as defined in previous Theorem. Then either:

(i).  $f(k^*) \ll 1$ , in which case almost surely  $\alpha(G)$  is equal to either  $k^* - 2$  or  $k^* - 1$ , or

(ii).  $f(k^* - 1) \gg 1$ , in which case almost surely  $\alpha(G)$  is equal to either  $k^* - 1$  or  $k^*$ .

*Proof.* Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. The latter is straightforward.

■ 5226

**Definition 30.0.17.** (Neutrosophic Threshold). 5227

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  5228  
is a probability Vertex-Decomposition. Let  $P$  be a monotone property of SuperHyperGraphs 5229  
(one which is preserved when SuperHyperEdges are added). Then a **Neutrosophic Threshold** 5230  
for  $P$  is a function  $f(n)$  such that: 5231

(i). if  $p << f(n)$ , then  $G \in \mathcal{G}_{n,p}$  almost surely does not have  $P$ , 5232

(ii). if  $p >> f(n)$ , then  $G \in \mathcal{G}_{n,p}$  almost surely has  $P$ . 5233

**Definition 30.0.18.** (Neutrosophic Balanced). 5234

Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider  $S = (V, E)$  5235  
is a probability Vertex-Decomposition. Let  $F$  be a fixed Neutrosophic SuperHyperGraph. Then 5236  
there is a threshold function for the property of containing a copy of  $F$  as a Neutrosophic 5237  
SubSuperHyperGraph is called **Neutrosophic Balanced**. 5238

**Theorem 30.0.19.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S =$  5239  
 $(V, E)$ . Consider  $S = (V, E)$  is a probability Vertex-Decomposition. Let  $F$  be a nonempty 5240  
balanced Neutrosophic SubSuperHyperGraph with  $k$  SuperHyperVertices and  $l$  SuperHyperEdges. 5241  
Then  $n^{-k/l}$  is a threshold function for the property of containing  $F$  as a Neutrosophic 5242  
SubSuperHyperGraph. 5243

*Proof.* Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider 5244  
 $S = (V, E)$  is a probability Vertex-Decomposition. The latter is straightforward. ■ 5245

136EXM1

**Example 30.0.20.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  5246  
in the mentioned Neutrosophic Figures in every Neutrosophic items. 5247

- On the Figure (30.1), the Neutrosophic SuperHyperNotion, namely, Neutrosophic 5248  
SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophicly 5249  
straightforward.  $E_1$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_2$  5250  
is a loop Neutrosophic SuperHyperEdge and  $E_4$  is a Neutrosophic SuperHyperEdge. 5251  
Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic 5252  
SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic 5253  
isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic 5254  
endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given 5255  
Neutrosophic SuperHyperVertex-Decomposition. 5256

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} = z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} = z^0.$$

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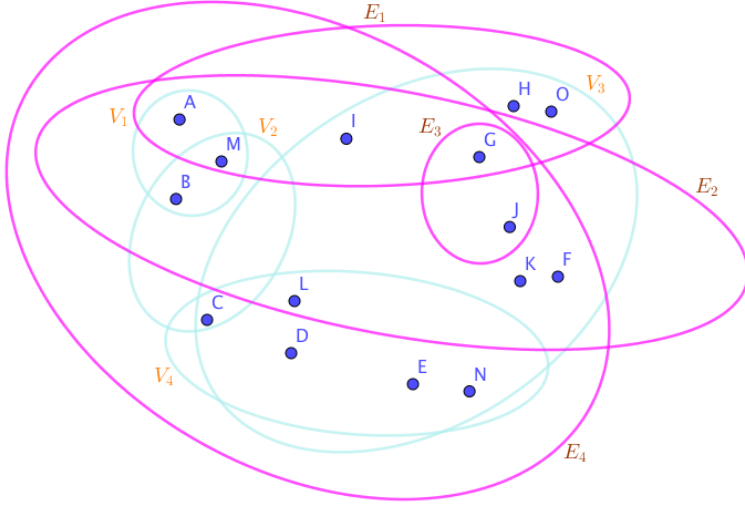


Figure 30.1: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG1

- On the Figure (30.2), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.  $E_1, E_2$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic SuperHyperVertex-Decomposition.

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} &= \{\{\}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} &= z^0. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} &= \{\{\}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} &= z^0. \end{aligned}$$

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- On the Figure (30.3), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} &= \{\{\}\}. \end{aligned}$$



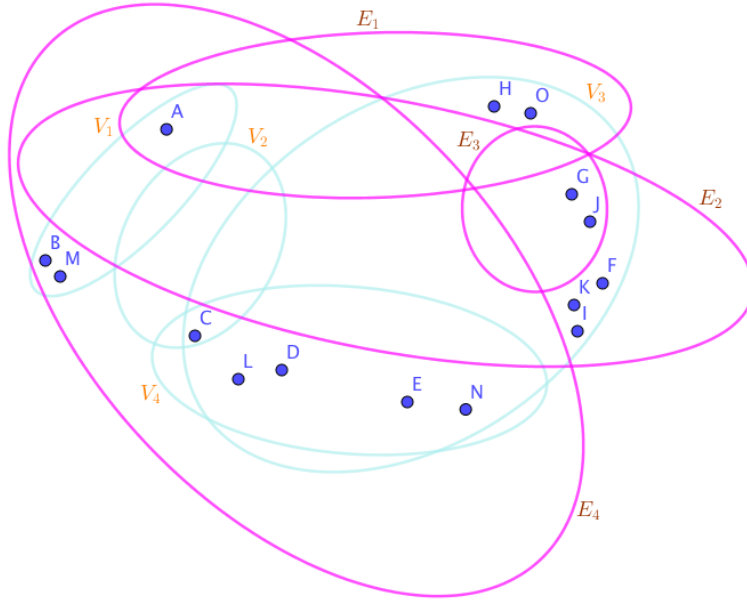


Figure 30.2: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG2

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} &= z^0. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\ &= \{\{\}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} &= z^0. \end{aligned}$$

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- On the Figure (30.4), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\ &= \{\{E_1\}, \{\}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^3 + z^0. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\ &= \{\{V_3\}, \{\}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^2 + z^0. \end{aligned}$$

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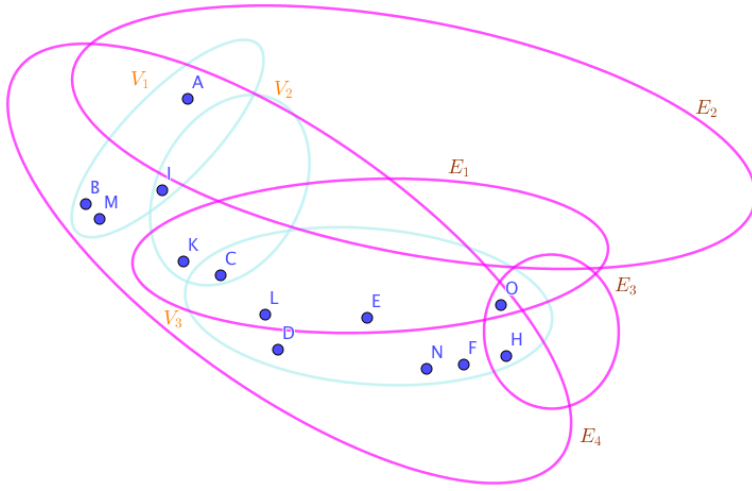


Figure 30.3: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG3

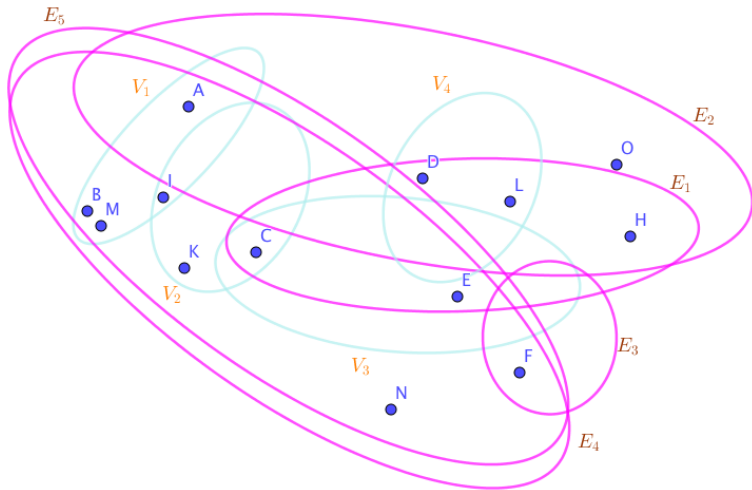


Figure 30.4: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG4

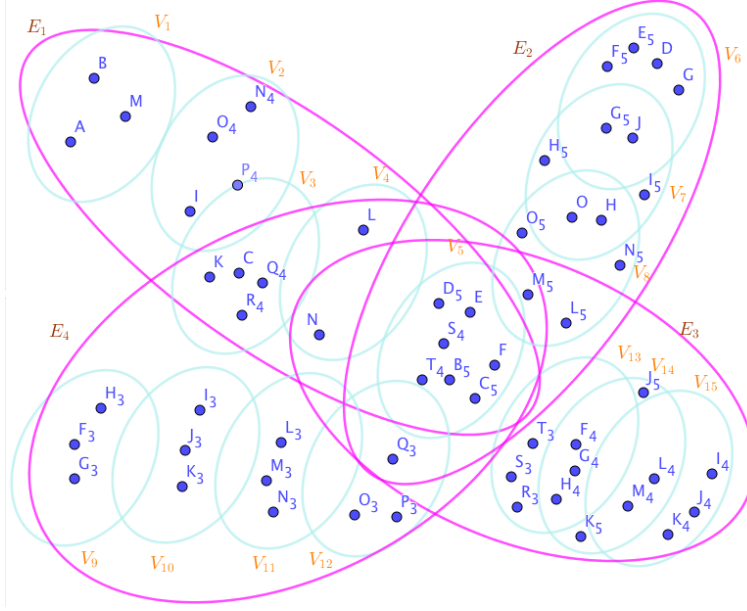


Figure 30.5: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG5

- On the Figure (30.5), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 5276 5277 5278

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}}$$

$$= \{\{V_5\}, \{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^7 + z^0.$$

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- On the Figure (30.6), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 5280 5281 5282

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

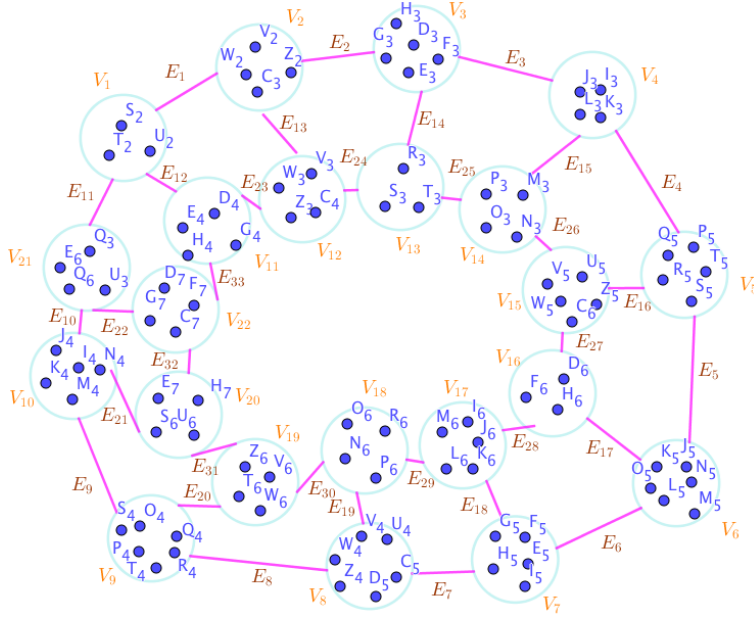


Figure 30.6: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG6

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\ &= \{\{\}\}. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

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- On the Figure (30.7), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\ &= \{\{\}\}. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\ &= \{\{\}\}. \end{aligned}$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}}$$

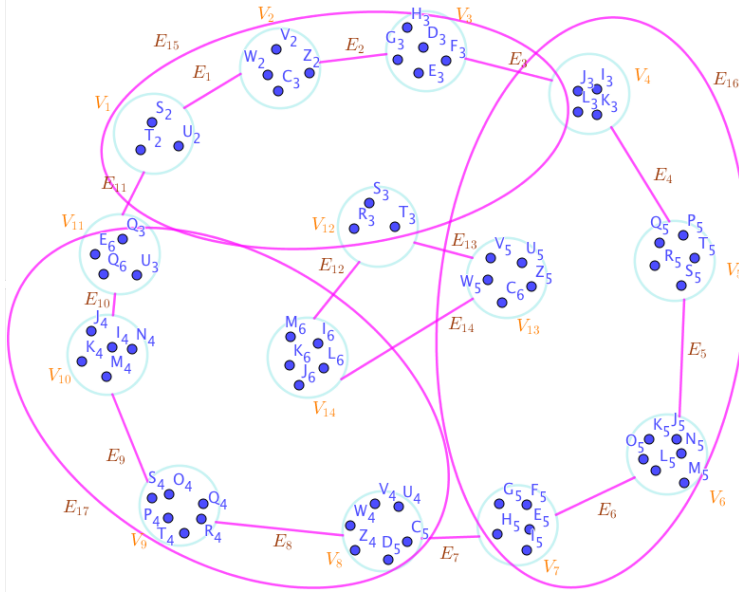


Figure 30.7: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG7

$$= z^0.$$

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- On the Figure (30.8), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} = \{\{E_4\}, \{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} = z^3 + z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} = \{\{V_{12}\}, \{V_{13}\}, \{V_{14}\}, \{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} = 2z^5 + z^3 + z^0.$$

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- On the Figure (30.9), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

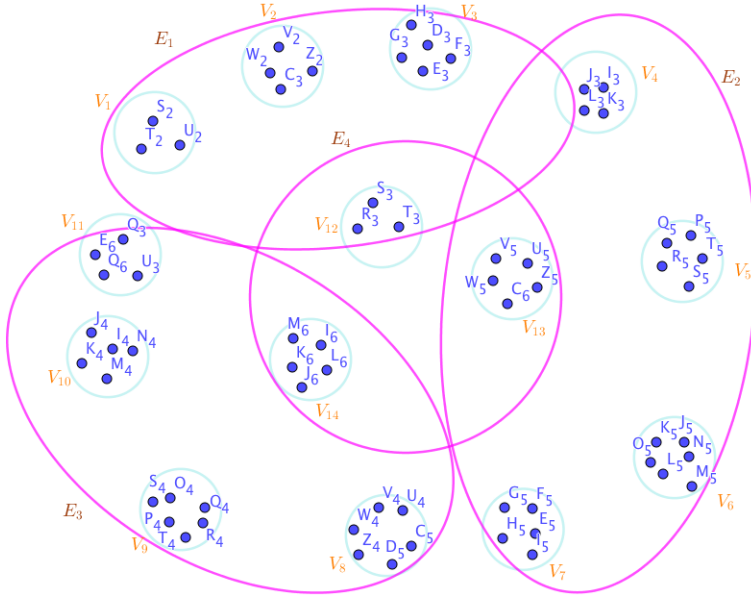


Figure 30.8: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG8

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

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- On the Figure (30.10), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}}$$

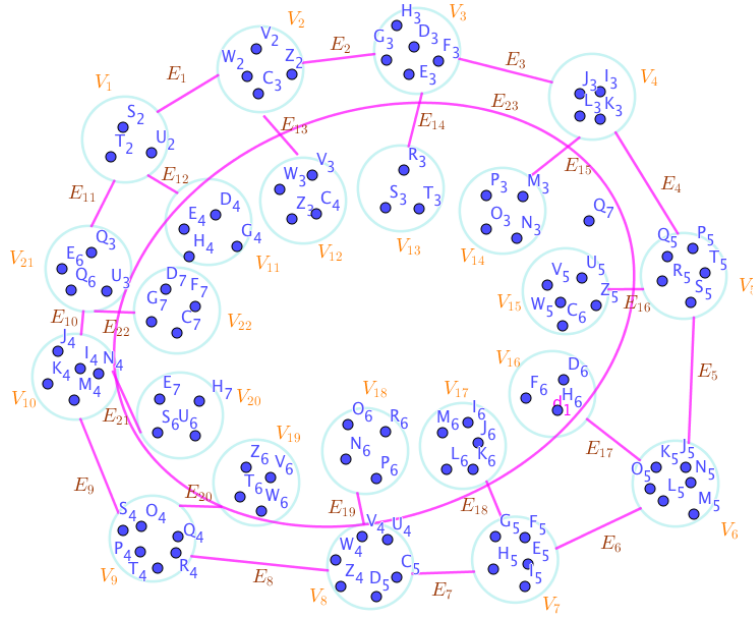


Figure 30.9: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG9

$$= z^0.$$

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- On the Figure (30.11), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\ &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\ &= 6z^2 + z^0. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\ &= \{\{\}\}. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

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- On the Figure (30.12), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically

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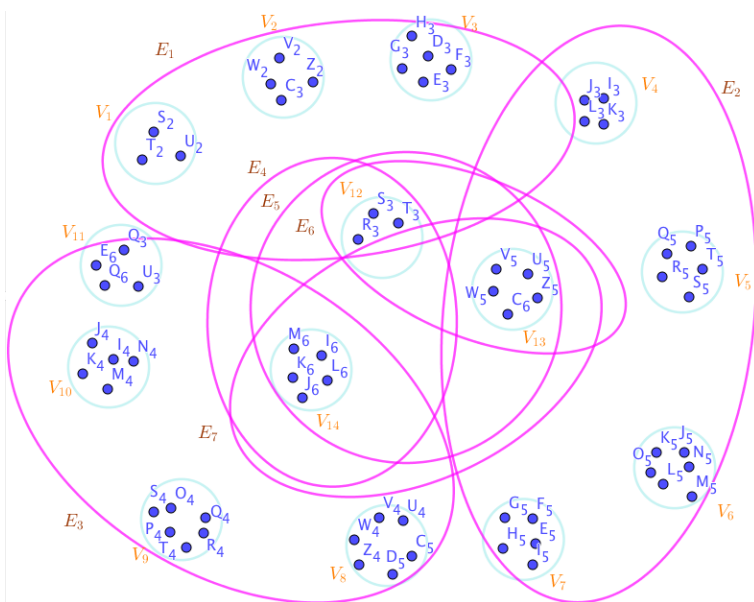


Figure 30.10: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG10

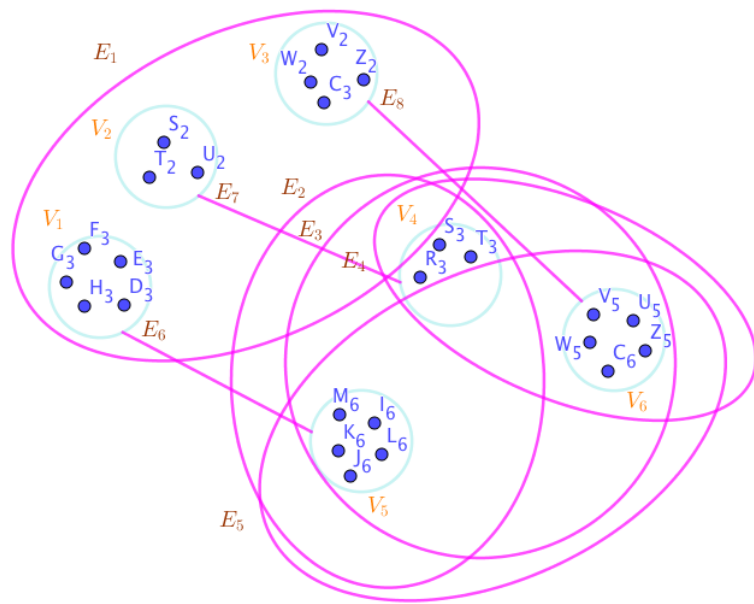


Figure 30.11: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG11



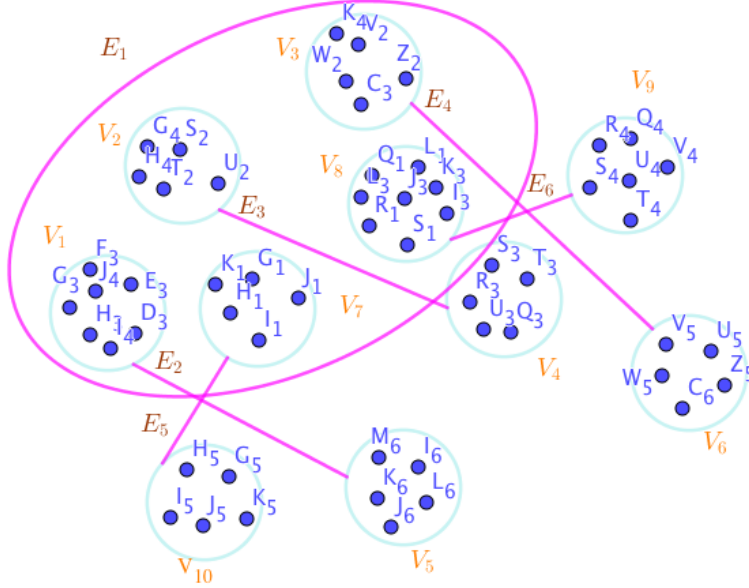


Figure 30.12: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG12

straightforward.

5306

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^5 + 5z^2 + z^0. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\
 &= \{\{V_1\}, \{V_2\}, \{V_3\}, \{V_7\}, \{V_8\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^8 + z^7 + 3z^5 + z^0.
 \end{aligned}$$

5307

- On the Figure (30.13), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}
 \end{aligned}$$

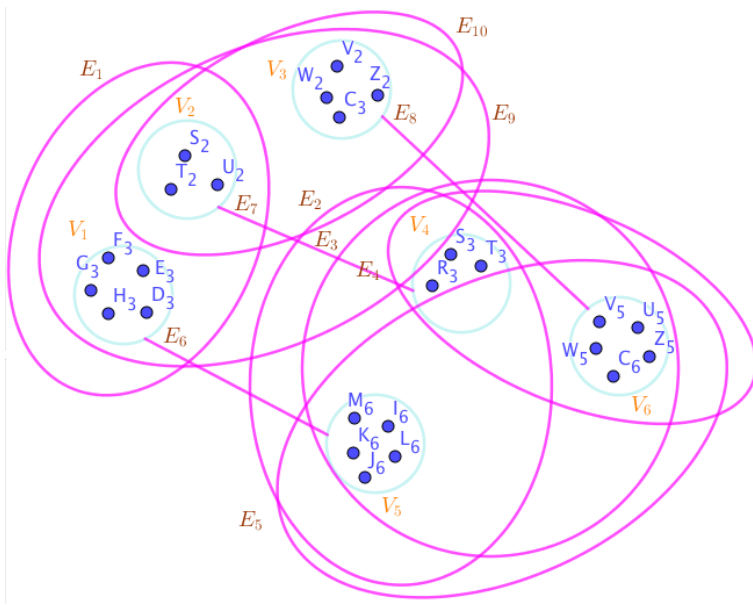


Figure 30.13: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG13

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

5311

- On the Figure (30.14), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

5314

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$= \{\{E_1\}, \{E_2\}, \{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}$$

$$= 2z^2 + z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}}$$

$$= \{\{V_1\}, \{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^5 + z^0.$$

5315

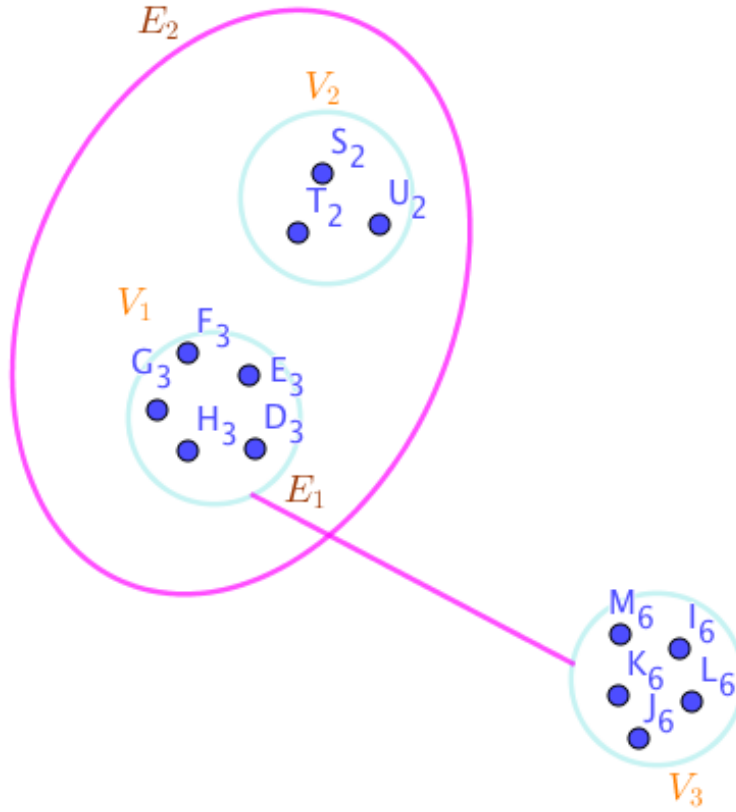


Figure 30.14: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG14

- On the Figure (30.15), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 5316 5317 5318

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\ &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\ &= 5z^2. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\ &= \{\{V_1\}, \{V_2\}, \{V_3\}, \{V_4\}, \{V_5\}, \{V_6\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= 3z^5 + z^3 + z^0. \end{aligned}$$

5319

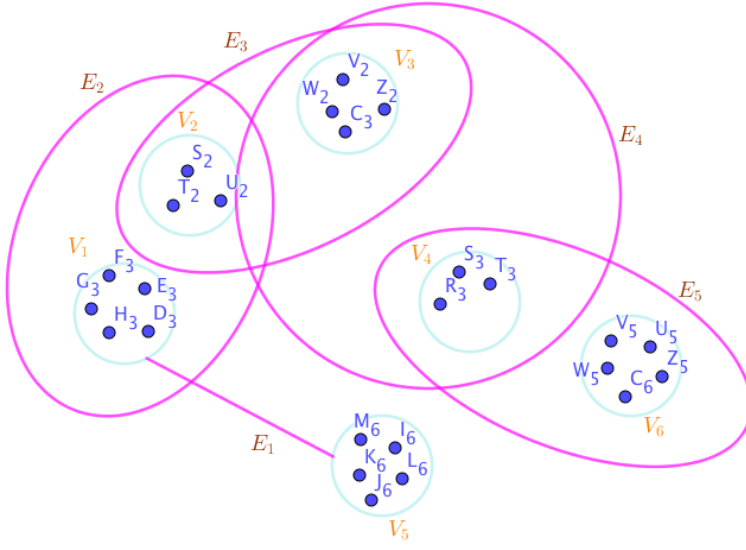


Figure 30.15: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG15

- On the Figure (30.16), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 5320 5321 5322

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^{10} + z^7 + z^6 + z^5 + z^2 + z^0. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\
 &= \{\{V_1\}, \{V_2\}, \{V_6\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= 2z^5 + z^3 + z^0.
 \end{aligned}$$

5323

- On the Figure (30.17), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 5324 5325 5326

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \\
 &6\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^{10} + z^8 + z^7 + z^6 + z^5 + z^2 + z^0.
 \end{aligned}$$

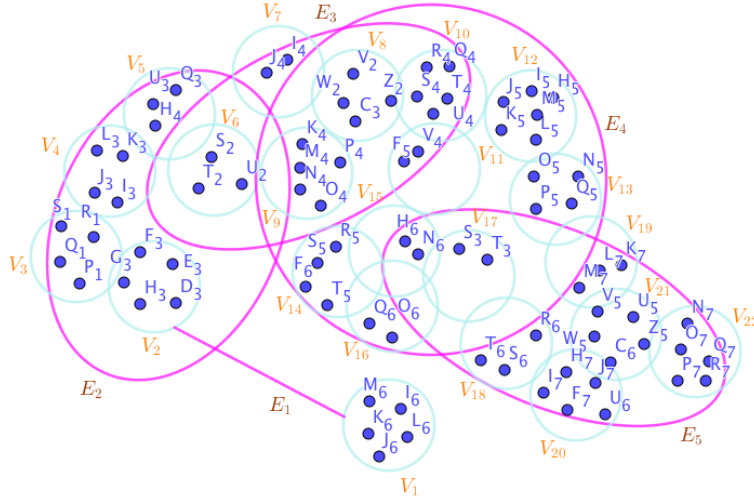


Figure 30.16: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG16

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} &= \{\{V_1\}, \{V_2\}, \{V_6\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} &= 2z^5 + z^3 + z^0. \end{aligned}$$

5327

- On the Figure (30.18), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 5328 5329 5330

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{E_6\}, \{\}\}. \end{aligned}$$

$$6\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^{10} + z^8 + z^7 + z^6 + z^5 + z^3 + z^0.$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} &= \{\{V_2\}, \{V_6\}, \{\}\}. \end{aligned}$$

$$\begin{aligned} \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} &= z^5 + z^3 + z^0. \end{aligned}$$

5331

- On the Figure (30.19), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically 5332 5333

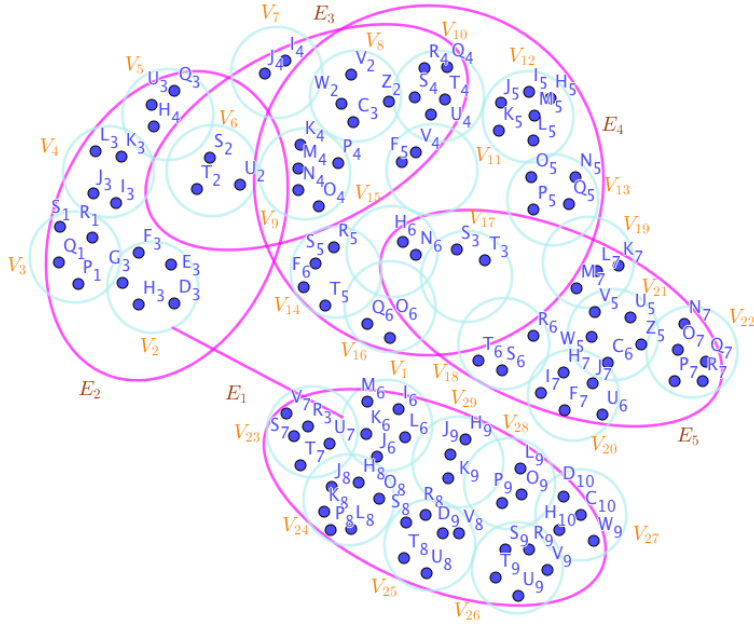


Figure 30.17: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG17

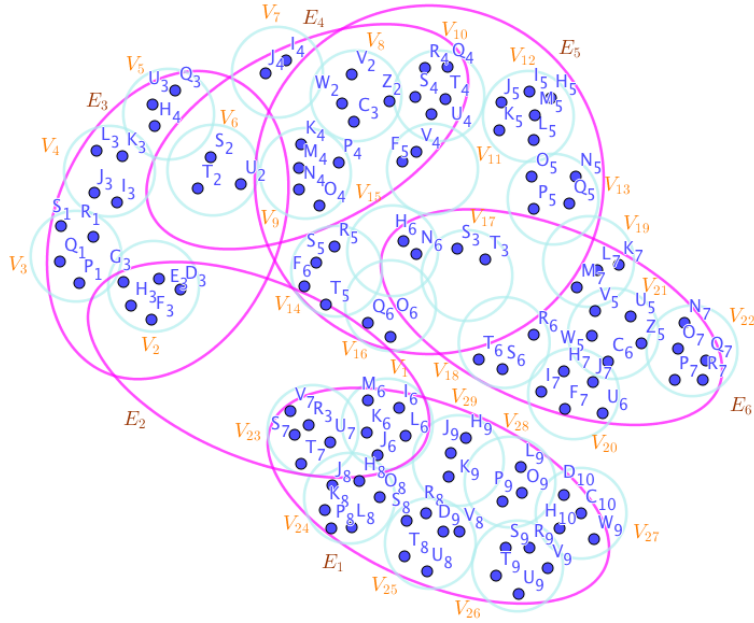


Figure 30.18: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG18

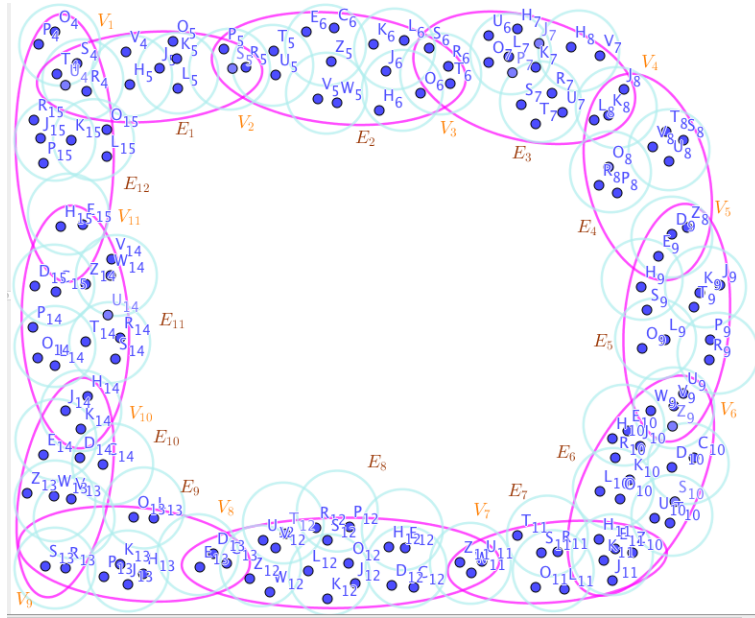


Figure 30.19: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

136NSHG19

straightforward.

5334

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$

5335

- On the Figure (30.20), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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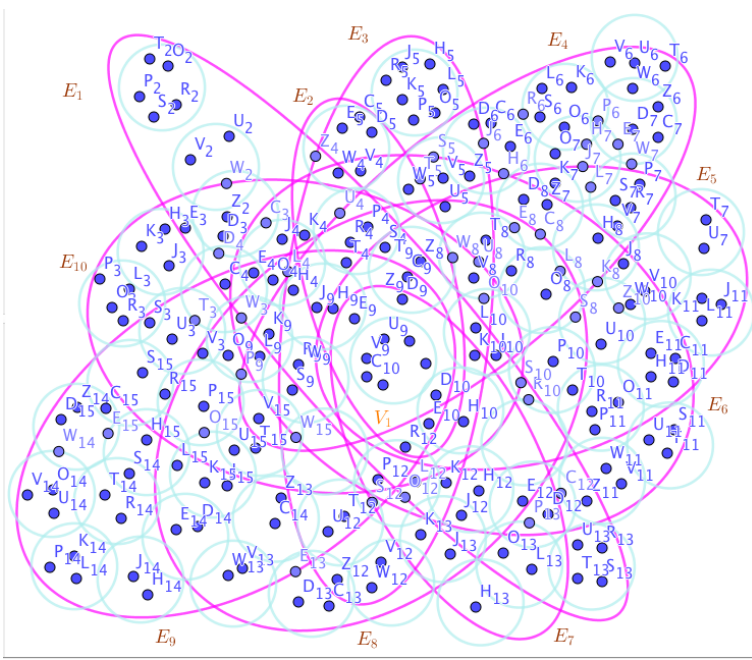
5338

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$= \{\{\}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}}$$

$$= z^0.$$





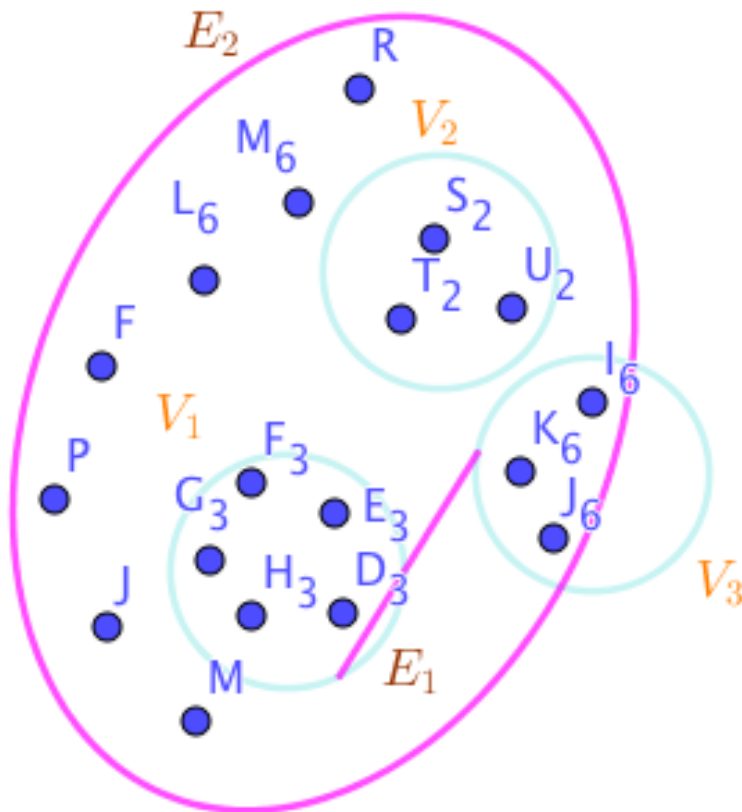


Figure 30.21: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

95NHG1

5343

- On the Figure (30.22), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperVertex-Decomposition, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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5346

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\
 &= \{\{E_1\}, \{E_2\}, \{E_3\}, \{E_4\}, \{E_5\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^{12} + z^{10} + z^9 + z^6 + z^2 + z^0. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\
 &= \{\{V_6\}, \{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^4 + z^0.
 \end{aligned}$$

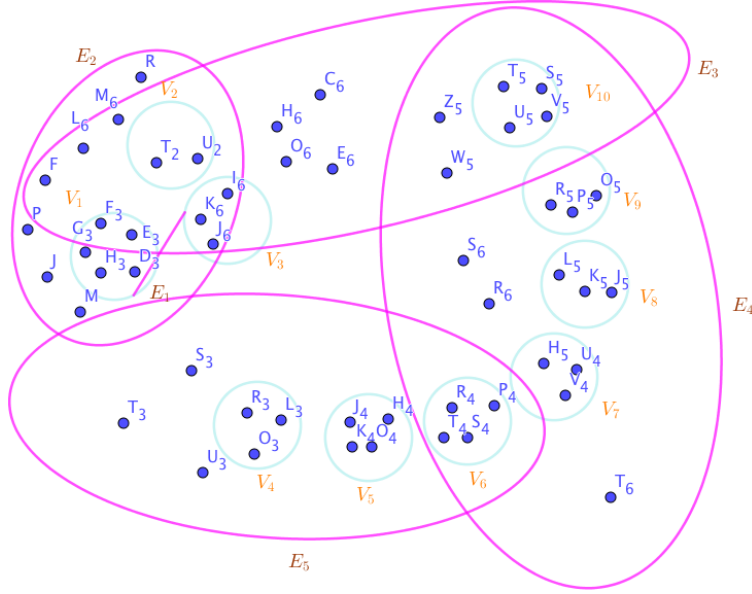


Figure 30.22: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions of Neutrosophic SuperHyperVertex-Decomposition in the Neutrosophic Example (42.0.3)

95NHG2

5347

**Proposition 30.0.21.** Assume a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . The all interior Neutrosophic SuperHyperVertices belong to any Neutrosophic quasi-R-Vertex-Decomposition if for any of them, and any of other corresponded Neutrosophic SuperHyperVertex, some interior Neutrosophic SuperHyperVertices are mutually Neutrosophic SuperHyperNeighbors with no Neutrosophic exception at all minus all Neutrosophic SuperHyperNeighbors to any amount of them.

**Proposition 30.0.22.** Assume a connected non-obvious Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . There's only one Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has only the maximum possibilities of the distinct interior Neutrosophic SuperHyperVertices inside of any given Neutrosophic quasi-R-Vertex-Decomposition minus all Neutrosophic SuperHyperNeighbor to some of them but not all of them. In other words, there's only an unique Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has only two distinct Neutrosophic SuperHyperVertices in an Neutrosophic quasi-R-Vertex-Decomposition, minus all Neutrosophic SuperHyperNeighbor to some of them but not all of them.

**Proposition 30.0.23.** Assume a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . If a Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has  $z$  Neutrosophic SuperHyperVertices, then the Neutrosophic cardinality of the Neutrosophic R-Vertex-Decomposition is at least

$$V \setminus (V \setminus \{a_E, b_E, c_E, \dots, z_E\}).$$

*It's straightforward that the Neutrosophic cardinality of the Neutrosophic R-Vertex-Decomposition is at least the maximum Neutrosophic number of Neutrosophic SuperHyperVertices of the Neutrosophic SuperHyperEdges with the maximum number of the Neutrosophic SuperHyperEdges. In other words, the maximum number of the Neutrosophic SuperHyperEdges contains the maximum Neutrosophic number of Neutrosophic SuperHyperVertices are renamed to Neutrosophic Vertex-Decomposition in some cases but the maximum number of the Neutrosophic SuperHyperEdge with the maximum Neutrosophic number of Neutrosophic SuperHyperVertices, has the Neutrosophic SuperHyperVertices are contained in a Neutrosophic R-Vertex-Decomposition.*

**Proposition 30.0.24.** *Assume a simple Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . Then the Neutrosophic number of type-result-R-Vertex-Decomposition has, the least Neutrosophic cardinality, the lower sharp Neutrosophic bound for Neutrosophic cardinality, is the Neutrosophic cardinality of*

$$V \setminus V \setminus \{a_E, b_{E'}, c_{E''}, c_{E'''}\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

*If there's a Neutrosophic type-result-R-Vertex-Decomposition with the least Neutrosophic cardinality, the lower sharp Neutrosophic bound for cardinality.*

**Proposition 30.0.25.** *Assume a connected loopless Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . Then in the worst case, literally,*

$$\begin{aligned} \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-Decomposition} &= \{V_1, E_1, V_2, E_2, V_3, E_3, V_4, E_4, V_1\}. \\ \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial} &= z^4. \\ \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-Decomposition} &= \{V_1, V_2, V_3, V_4, V_1\}. \\ \mathcal{C}(NSHG)_{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial} &= z^5. \end{aligned}$$

*Is a Neutrosophic type-result-Vertex-Decomposition. In other words, the least cardinality, the lower sharp bound for the cardinality, of a Neutrosophic type-result-Vertex-Decomposition is the cardinality of*

$$\begin{aligned} \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-Decomposition} &= \{V_1, E_1, V_2, E_2, V_3, E_3, V_4, E_4, V_1\}. \\ \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial} &= z^4. \\ \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-Decomposition} &= \{V_1, V_2, V_3, V_4, V_1\}. \\ \mathcal{C}(NSHG)_{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial} &= z^5. \end{aligned}$$

*Proof.* Assume a connected loopless Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . The SuperHyperSet of the SuperHyperVertices  $V \setminus V \setminus \{z\}$  isn't a quasi-R-Vertex-Decomposition since neither amount of Neutrosophic SuperHyperEdges nor amount of SuperHyperVertices where amount refers to the Neutrosophic number of SuperHyperVertices(-/SuperHyperEdges) more than one to form any kind of SuperHyperEdges or any number of SuperHyperEdges. Let us consider the Neutrosophic SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E,E'=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

This Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices has the eligibilities to propose property such that there's no Neutrosophic SuperHyperVertex of a Neutrosophic

SuperHyperEdge is common and there's an Neutrosophic SuperHyperEdge for all Neutrosophic SuperHyperVertices but the maximum Neutrosophic cardinality indicates that these Neutrosophic type-SuperHyperSets couldn't give us the Neutrosophic lower bound in the term of Neutrosophic sharpness. In other words, the Neutrosophic SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E'} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}$$

of the Neutrosophic SuperHyperVertices implies at least on-quasi-triangle style is up but sometimes the Neutrosophic SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E'} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}$$

of the Neutrosophic SuperHyperVertices is free-quasi-triangle and it doesn't make a contradiction to the supposition on the connected loopless Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . Thus the minimum case never happens in the generality of the connected loopless Neutrosophic SuperHyperGraphs. Thus if we assume in the worst case, literally,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=E} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

Is a quasi-R-Vertex-Decomposition. In other words, the least cardinality, the lower sharp bound for the cardinality, of a quasi-R-Vertex-Decomposition is the cardinality of

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=E} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

Then we've lost some connected loopless Neutrosophic SuperHyperClasses of the connected loopless Neutrosophic SuperHyperGraphs titled free-triangle, on-triangle, and their quasi-types but the SuperHyperStable is only up in this quasi-R-Vertex-Decomposition. It's the contradiction to that fact on the generality. There are some counterexamples to deny this statement. One of them comes from the setting of the graph titled path and cycle as the counterexamples-classes or reversely direction star as the examples-classes, are well-known classes in that setting and they could be considered as the examples-classes and counterexamples-classes for the tight bound of

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=E} = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}.$$

Let  $V \setminus V \setminus \{z\}$  in mind. There's no necessity on the SuperHyperEdge since we need at least two SuperHyperVertices to form a SuperHyperEdge. It doesn't withdraw the principles of the main definition since there's no condition to be satisfied but the condition is on the existence of the SuperHyperEdge instead of acting on the SuperHyperVertices. In other words, if there's a SuperHyperEdge, then the Neutrosophic SuperHyperSet has the necessary condition for the intended definition to be applied. Thus the  $V \setminus V \setminus \{z\}$  is withdrawn not by the conditions of the main definition but by the necessity of the pre-condition on the usage of the main definition. The Neutrosophic structure of the Neutrosophic R-Vertex-Decomposition decorates the Neutrosophic SuperHyperVertices don't have received any Neutrosophic connections so as this Neutrosophic style implies different versions of Neutrosophic SuperHyperEdges with the maximum Neutrosophic cardinality in the terms of Neutrosophic SuperHyperVertices are spotlight. The lower Neutrosophic bound is to have the maximum Neutrosophic groups of Neutrosophic SuperHyperVertices have perfect Neutrosophic connections inside

each of SuperHyperEdges and the outside of this Neutrosophic SuperHyperSet doesn't matter but regarding the connectedness of the used Neutrosophic SuperHyperGraph arising from its Neutrosophic properties taken from the fact that it's simple. If there's no more than one Neutrosophic SuperHyperVertex in the targeted Neutrosophic SuperHyperSet, then there's no Neutrosophic connection. Furthermore, the Neutrosophic existence of one Neutrosophic SuperHyperVertex has no Neutrosophic effect to talk about the Neutrosophic R-Vertex-Decomposition. Since at least two Neutrosophic SuperHyperVertices involve to make a title in the Neutrosophic background of the Neutrosophic SuperHyperGraph. The Neutrosophic SuperHyperGraph is obvious if it has no Neutrosophic SuperHyperEdge but at least two Neutrosophic SuperHyperVertices make the Neutrosophic version of Neutrosophic SuperHyperEdge. Thus in the Neutrosophic setting of non-obvious Neutrosophic SuperHyperGraph, there are at least one Neutrosophic SuperHyperEdge. It's necessary to mention that the word "Simple" is used as Neutrosophic adjective for the initial Neutrosophic SuperHyperGraph, induces there's no Neutrosophic appearance of the loop Neutrosophic version of the Neutrosophic SuperHyperEdge and this Neutrosophic SuperHyperGraph is said to be loopless. The Neutrosophic adjective "loop" on the basic Neutrosophic framework engages one Neutrosophic SuperHyperVertex but it never happens in this Neutrosophic setting. With these Neutrosophic bases, on a Neutrosophic SuperHyperGraph, there's at least one Neutrosophic SuperHyperEdge thus there's at least a Neutrosophic R-Vertex-Decomposition has the Neutrosophic cardinality of a Neutrosophic SuperHyperEdge. Thus, a Neutrosophic R-Vertex-Decomposition has the Neutrosophic cardinality at least a Neutrosophic SuperHyperEdge. Assume a Neutrosophic SuperHyperSet  $V \setminus V \setminus \{z\}$ . This Neutrosophic SuperHyperSet isn't a Neutrosophic R-Vertex-Decomposition since either the Neutrosophic SuperHyperGraph is an obvious Neutrosophic SuperHyperModel thus it never happens since there's no Neutrosophic usage of this Neutrosophic framework and even more there's no Neutrosophic connection inside or the Neutrosophic SuperHyperGraph isn't obvious and as its consequences, there's a Neutrosophic contradiction with the term "Neutrosophic R-Vertex-Decomposition" since the maximum Neutrosophic cardinality never happens for this Neutrosophic style of the Neutrosophic SuperHyperSet and beyond that there's no Neutrosophic connection inside as mentioned in first Neutrosophic case in the forms of drawback for this selected Neutrosophic SuperHyperSet. Let

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E' = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}}$$

Comes up. This Neutrosophic case implies having the Neutrosophic style of on-quasi-triangle Neutrosophic style on the every Neutrosophic elements of this Neutrosophic SuperHyperSet. Precisely, the Neutrosophic R-Vertex-Decomposition is the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices such that some Neutrosophic amount of the Neutrosophic SuperHyperVertices are on-quasi-triangle Neutrosophic style. The Neutrosophic cardinality of the v SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots, a_{E'}, b_{E'}, c_{E'}, \dots\}_{E, E' = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}}$$

Is the maximum in comparison to the Neutrosophic SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E = \{E \in E_{ESHG:(V, E)} \mid |E| = \max\{|E| \mid E \in E_{ESHG:(V, E)}\}\}} \cdot$$

But the lower Neutrosophic bound is up. Thus the minimum Neutrosophic cardinality of the maximum Neutrosophic cardinality ends up the Neutrosophic discussion. The first Neutrosophic

term refers to the Neutrosophic setting of the Neutrosophic SuperHyperGraph but this key point is enough since there's a Neutrosophic SuperHyperClass of a Neutrosophic SuperHyperGraph has no on-quasi-triangle Neutrosophic style amid some amount of its Neutrosophic SuperHyperVertices. This Neutrosophic setting of the Neutrosophic SuperHyperModel proposes a Neutrosophic SuperHyperSet has only some amount Neutrosophic SuperHyperVertices from one Neutrosophic SuperHyperEdge such that there's no Neutrosophic amount of Neutrosophic SuperHyperEdges more than one involving these some amount of these Neutrosophic SuperHyperVertices. The Neutrosophic cardinality of this Neutrosophic SuperHyperSet is the maximum and the Neutrosophic case is occurred in the minimum Neutrosophic situation. To sum them up, the Neutrosophic SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

Has the maximum Neutrosophic cardinality such that

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

Contains some Neutrosophic SuperHyperVertices such that there's distinct-covers-order-amount Neutrosophic SuperHyperEdges for amount of Neutrosophic SuperHyperVertices taken from the Neutrosophic SuperHyperSet

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

It means that the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

Is a Neutrosophic R-Vertex-Decomposition for the Neutrosophic SuperHyperGraph as used Neutrosophic background in the Neutrosophic terms of worst Neutrosophic case and the common theme of the lower Neutrosophic bound occurred in the specific Neutrosophic SuperHyperClasses of the Neutrosophic SuperHyperGraphs which are Neutrosophic free-quasi-triangle.

Assume a Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has  $z$  Neutrosophic number of the Neutrosophic SuperHyperVertices. Then every Neutrosophic SuperHyperVertex has at least no Neutrosophic SuperHyperEdge with others in common. Thus those Neutrosophic SuperHyperVertices have the eligibles to be contained in a Neutrosophic R-Vertex-Decomposition. Those Neutrosophic SuperHyperVertices are potentially included in a Neutrosophic style-R-Vertex-Decomposition. Formally, consider

$$V \setminus (V \setminus \{a_E, b_E, c_E, \dots, z_E\}).$$

Are the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$ . Thus

$$Z_i \sim Z_j, \ i \neq j, \ i, j = 1, 2, \dots, z.$$

where the  $\sim$  isn't an equivalence relation but only the symmetric relation on the Neutrosophic SuperHyperVertices of the Neutrosophic SuperHyperGraph. The formal definition is as follows.

$$Z_i \sim Z_j, \ i \neq j, \ i, j = 1, 2, \dots, z$$

if and only if  $Z_i$  and  $Z_j$  are the Neutrosophic SuperHyperVertices and there's only and only one Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  between the Neutrosophic SuperHyperVertices  $Z_i$  and  $Z_j$ . The other definition for the Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  in the terms of Neutrosophic R-Vertex-Decomposition is

$$\{a_E, b_E, c_E, \dots, z_E\}.$$

This definition coincides with the definition of the Neutrosophic R-Vertex-Decomposition but with slightly differences in the maximum Neutrosophic cardinality amid those Neutrosophic type-SuperHyperSets of the Neutrosophic SuperHyperVertices. Thus the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices,

$$\max_z |\{Z_1, Z_2, \dots, Z_z \mid Z_i \sim Z_j, i \neq j, i, j = 1, 2, \dots, z\}|_{\text{Neutrosophic cardinality}},$$

and

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

is formalized with mathematical literatures on the Neutrosophic R-Vertex-Decomposition. Let  $Z_i \stackrel{E}{\sim} Z_j$ , be defined as  $Z_i$  and  $Z_j$  are the Neutrosophic SuperHyperVertices belong to the Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$ . Thus,

$$E = \{Z_1, Z_2, \dots, Z_z \mid Z_i \stackrel{E}{\sim} Z_j, i \neq j, i, j = 1, 2, \dots, z\}.$$

Or

$$\{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

But with the slightly differences,

5377

Neutrosophic R-Vertex-Decomposition =

$$\{Z_1, Z_2, \dots, Z_z \mid \forall i \neq j, i, j = 1, 2, \dots, z, \exists E_x, Z_i \stackrel{E_x}{\sim} Z_j\}.$$

5378

Neutrosophic R-Vertex-Decomposition =

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

Thus  $E \in E_{ESHG:(V,E)}$  is a Neutrosophic quasi-R-Vertex-Decomposition where  $E \in E_{ESHG:(V,E)}$  is fixed that means  $E_x = E \in E_{ESHG:(V,E)}$ . for all Neutrosophic intended SuperHyperVertices but in a Neutrosophic Vertex-Decomposition,  $E_x = E \in E_{ESHG:(V,E)}$  could be different and it's not unique. To sum them up, in a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . If a Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has  $z$  Neutrosophic SuperHyperVertices, then the Neutrosophic cardinality of the Neutrosophic R-Vertex-Decomposition is at least

$$V \setminus (V \setminus \{a_E, b_E, c_E, \dots, z_E\}).$$

It's straightforward that the Neutrosophic cardinality of the Neutrosophic R-Vertex- 5379  
 Decomposition is at least the maximum Neutrosophic number of Neutrosophic SuperHyperVer- 5380  
 tices of the Neutrosophic SuperHyperEdges with the maximum number of the Neutrosophic 5381



SuperHyperEdges. In other words, the maximum number of the Neutrosophic SuperHyperEdges contains the maximum Neutrosophic number of Neutrosophic SuperHyperVertices are renamed to Neutrosophic Vertex-Decomposition in some cases but the maximum number of the Neutrosophic SuperHyperEdge with the maximum Neutrosophic number of Neutrosophic SuperHyperVertices, has the Neutrosophic SuperHyperVertices are contained in a Neutrosophic R-Vertex-Decomposition.

The obvious SuperHyperGraph has no Neutrosophic SuperHyperEdges. But the non-obvious Neutrosophic SuperHyperModel is up. The quasi-SuperHyperModel addresses some issues about the Neutrosophic optimal SuperHyperObject. It specially delivers some remarks on the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices such that there's distinct amount of Neutrosophic SuperHyperEdges for distinct amount of Neutrosophic SuperHyperVertices up to all taken from that Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices but this Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices is either has the maximum Neutrosophic SuperHyperCardinality or it doesn't have maximum Neutrosophic SuperHyperCardinality. In a non-obvious SuperHyperModel, there's at least one Neutrosophic SuperHyperEdge containing at least all Neutrosophic SuperHyperVertices. Thus it forms a Neutrosophic quasi-R-Vertex-Decomposition where the Neutrosophic completion of the Neutrosophic incidence is up in that. Thus it's, literarily, a Neutrosophic embedded R-Vertex-Decomposition. The SuperHyperNotions of embedded SuperHyperSet and quasi-SuperHyperSet coincide. In the original setting, these types of SuperHyperSets only don't satisfy on the maximum SuperHyperCardinality. Thus the embedded setting is elected such that those SuperHyperSets have the maximum Neutrosophic SuperHyperCardinality and they're Neutrosophic SuperHyperOptimal. The less than two distinct types of Neutrosophic SuperHyperVertices are included in the minimum Neutrosophic style of the embedded Neutrosophic R-Vertex-Decomposition. The interior types of the Neutrosophic SuperHyperVertices are deciders. Since the Neutrosophic number of SuperHyperNeighbors are only affected by the interior Neutrosophic SuperHyperVertices. The common connections, more precise and more formal, the perfect unique connections inside the Neutrosophic SuperHyperSet for any distinct types of Neutrosophic SuperHyperVertices pose the Neutrosophic R-Vertex-Decomposition. Thus Neutrosophic exterior SuperHyperVertices could be used only in one Neutrosophic SuperHyperEdge and in Neutrosophic SuperHyperRelation with the interior Neutrosophic SuperHyperVertices in that Neutrosophic SuperHyperEdge. In the embedded Neutrosophic Vertex-Decomposition, there's the usage of exterior Neutrosophic SuperHyperVertices since they've more connections inside more than outside. Thus the title "exterior" is more relevant than the title "interior". One Neutrosophic SuperHyperVertex has no connection, inside. Thus, the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices with one SuperHyperElement has been ignored in the exploring to lead on the optimal case implying the Neutrosophic R-Vertex-Decomposition. The Neutrosophic R-Vertex-Decomposition with the exclusion of the exclusion of all Neutrosophic SuperHyperVertices in one Neutrosophic SuperHyperEdge and with other terms, the Neutrosophic R-Vertex-Decomposition with the inclusion of all Neutrosophic SuperHyperVertices in one Neutrosophic SuperHyperEdge, is a Neutrosophic quasi-R-Vertex-Decomposition. To sum them up, in a connected non-obvious Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . There's only one Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has only the maximum possibilities of the distinct interior Neutrosophic SuperHyperVertices inside of any given Neutrosophic quasi-R-Vertex-Decomposition minus all Neutrosophic SuperHyperNeighbor to some of them but not all of them. In other words, there's only an unique Neutrosophic SuperHyperEdge  $E \in E_{ESHG:(V,E)}$  has only two distinct



Neutrosophic SuperHyperVertices in an Neutrosophic quasi-R-Vertex-Decomposition, minus all 5428  
 Neutrosophic SuperHyperNeighbor to some of them but not all of them. 5429  
 The main definition of the Neutrosophic R-Vertex-Decomposition has two titles. a Neut- 5430  
 rosophic quasi-R-Vertex-Decomposition and its corresponded quasi-maximum Neutrosophic 5431  
 R-SuperHyperCardinality are two titles in the terms of quasi-R-styles. For any Neutrosophic 5432  
 number, there's a Neutrosophic quasi-R-Vertex-Decomposition with that quasi-maximum 5433  
 Neutrosophic SuperHyperCardinality in the terms of the embedded Neutrosophic SuperHy- 5434  
 perGraph. If there's an embedded Neutrosophic SuperHyperGraph, then the Neutrosophic 5435  
 quasi-SuperHyperNotions lead us to take the collection of all the Neutrosophic quasi-R-Vertex- 5436  
 Decompositions for all Neutrosophic numbers less than its Neutrosophic corresponded maximum 5437  
 number. The essence of the Neutrosophic Vertex-Decomposition ends up but this essence starts 5438  
 up in the terms of the Neutrosophic quasi-R-Vertex-Decomposition, again and more in the 5439  
 operations of collecting all the Neutrosophic quasi-R-Vertex-Decompositions acted on the all 5440  
 possible used formations of the Neutrosophic SuperHyperGraph to achieve one Neutrosophic 5441  
 number. This Neutrosophic number is 5442  
 considered as the equivalence class for all corresponded quasi-R-Vertex-Decompositions. Let 5443  
 $z_{\text{Neutrosophic Number}}$ ,  $S_{\text{Neutrosophic SuperHyperSet}}$  and  $G_{\text{Neutrosophic Vertex-Decomposition}}$  be a Neutro- 5444  
 sophic number, a Neutrosophic SuperHyperSet and a Neutrosophic Vertex-Decomposition. 5445  
 Then 5446

$$\begin{aligned} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} &= \{S_{\text{Neutrosophic SuperHyperSet}} \mid \\ &S_{\text{Neutrosophic SuperHyperSet}} = G_{\text{Neutrosophic Vertex-Decomposition}}, \\ &|S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= z_{\text{Neutrosophic Number}}\}. \end{aligned}$$

As its consequences, the formal definition of the Neutrosophic Vertex-Decomposition is re- 5447  
 formalized and redefined as follows. 5448

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} = \\ \cup_{z_{\text{Neutrosophic Number}}} \{S_{\text{Neutrosophic SuperHyperSet}} \mid \\ &S_{\text{Neutrosophic SuperHyperSet}} = G_{\text{Neutrosophic Vertex-Decomposition}}, \\ &|S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= z_{\text{Neutrosophic Number}}\}. \end{aligned}$$

To get more precise perceptions, the follow-up expressions propose another formal technical 5449  
 definition for the Neutrosophic Vertex-Decomposition. 5450

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ \{S \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} &= \\ \cup_{z_{\text{Neutrosophic Number}}} \{S_{\text{Neutrosophic SuperHyperSet}} \mid \\ &S_{\text{Neutrosophic SuperHyperSet}} = G_{\text{Neutrosophic Vertex-Decomposition}}, \\ &|S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= z_{\text{Neutrosophic Number}} \mid \\ &|S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \end{aligned}$$

$$= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} \{z_{\text{Neutrosophic Number}}\}.$$

In more concise and more convenient ways, the modified definition for the Neutrosophic Vertex-  
Decomposition poses the upcoming expressions. 5451  
5452

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ \{S \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\ |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} \{z_{\text{Neutrosophic Number}}\}. \end{aligned}$$

To translate the statement to this mathematical literature, the formulae will be revised. 5453

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ \{S \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\ |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} \{z_{\text{Neutrosophic Number}}\} \\ &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. \end{aligned}$$

And then, 5454

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ \{S \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\ |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. \end{aligned}$$

To get more visions in the closer look-up, there's an overall overlook. 5455

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} = \\ \cup_{z_{\text{Neutrosophic Number}}} \{S_{\text{Neutrosophic SuperHyperSet}} \mid \\ S_{\text{Neutrosophic SuperHyperSet}} &= G_{\text{Neutrosophic Vertex-Decomposition}}, \\ |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. \end{aligned}$$

5456

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ \{S \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} &= \\ \cup_{z_{\text{Neutrosophic Number}}} \{S_{\text{Neutrosophic SuperHyperSet}} \mid \\ S_{\text{Neutrosophic SuperHyperSet}} &= G_{\text{Neutrosophic Vertex-Decomposition}}, \\ |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= z_{\text{Neutrosophic Number}} \mid \\ |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. \end{aligned}$$

5457

$$\begin{aligned}
 G_{\text{Neutrosophic Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\
 |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\
 &= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} z_{\text{Neutrosophic Number}} \\
 &= \max \{ |E| \mid E \in E_{ESHG:(V,E)} \}.
 \end{aligned}$$

5458

$$\begin{aligned}
 G_{\text{Neutrosophic Vertex-Decomposition}} &= \\
 \{S \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\
 |S_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\
 &= \max \{ |E| \mid E \in E_{ESHG:(V,E)} \}.
 \end{aligned}$$

Now, the extension of these types of approaches is up. Since the new term, “Neutrosophic SuperHyperNeighbor-  
hood”, could be redefined as the collection of the Neutrosophic SuperHyperVertices such that any amount of its Neutrosophic SuperHyperVertices are incident to a Neutrosophic  
SuperHyperEdge. It’s, literarily, another name for “Neutrosophic Quasi-Vertex-Decomposition” but, precisely, it’s the generalization of “Neutrosophic Quasi-Vertex-Decomposition” since  
“Neutrosophic Quasi-Vertex-Decomposition” happens “Neutrosophic Vertex-Decomposition” in a Neutrosophic SuperHyperGraph as initial framework and background but “Neutrosophic  
SuperHyperNeighbor-  
hood” may not happens “Neutrosophic Vertex-Decomposition” in a Neutrosophic SuperHyperGraph as initial framework and preliminarily background since  
there are some ambiguities about the Neutrosophic SuperHyperCardinality arise from it. To get orderly keywords, the terms, “Neutrosophic SuperHyperNeighbor-  
hood”, “Neutrosophic Quasi-Vertex-Decomposition”, and “Neutrosophic Vertex-Decomposition” are up.  
Thus, let  $z_{\text{Neutrosophic Number}}$ ,  $N_{\text{Neutrosophic SuperHyperNeighbor-  
hood}}$  and  $G_{\text{Neutrosophic Vertex-Decomposition}}$  be a Neutrosophic number, a Neutrosophic SuperHyperNeighbor-  
hood and a Neutrosophic Vertex-Decomposition and the new terms are up.

$$\begin{aligned}
 G_{\text{Neutrosophic Vertex-Decomposition}} &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} = \\
 \cup_{z_{\text{Neutrosophic Number}}} \{N_{\text{Neutrosophic SuperHyperNeighbor-  
hood}} \mid \\
 |N_{\text{Neutrosophic SuperHyperNeighbor-  
hood}}|_{\text{Neutrosophic Cardinality}} \\
 &= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} z_{\text{Neutrosophic Number}} \}.
 \end{aligned}$$

5474

$$\begin{aligned}
 G_{\text{Neutrosophic Vertex-Decomposition}} &= \\
 \{N_{\text{Neutrosophic SuperHyperNeighbor-  
hood}} \\
 \in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} &= \\
 \cup_{z_{\text{Neutrosophic Number}}} \{N_{\text{Neutrosophic SuperHyperNeighbor-  
hood}} \mid \\
 |N_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\
 &= z_{\text{Neutrosophic Number}} \mid \\
 |N_{\text{Neutrosophic SuperHyperNeighbor-  
hood}}|_{\text{Neutrosophic Cardinality}}
 \end{aligned}$$

$$= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} z_{\text{Neutrosophic Number}}\}.$$

5475

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ &\{N_{\text{Neutrosophic SuperHyperNeighborhood}} \\ &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\ &|N_{\text{Neutrosophic SuperHyperNeighborhood}}|_{\text{Neutrosophic Cardinality}} \\ &= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} z_{\text{Neutrosophic Number}}\}. \end{aligned}$$

5476

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ &\{N_{\text{Neutrosophic SuperHyperNeighborhood}} \\ &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\ &|N_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} z_{\text{Neutrosophic Number}}\}. \end{aligned}$$

And with go back to initial structure,

5477

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} = \\ &\cup_{z_{\text{Neutrosophic Number}}} \{N_{\text{Neutrosophic SuperHyperNeighborhood}} \mid \\ &|N_{\text{Neutrosophic SuperHyperNeighborhood}}|_{\text{Neutrosophic Cardinality}} \\ &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. \end{aligned}$$

5478

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ &\{N_{\text{Neutrosophic SuperHyperNeighborhood}} \\ &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} = \\ &\cup_{z_{\text{Neutrosophic Number}}} \{N_{\text{Neutrosophic SuperHyperNeighborhood}} \mid \\ &|N_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\ &= z_{\text{Neutrosophic Number}} \mid \\ &|N_{\text{Neutrosophic SuperHyperNeighborhood}}|_{\text{Neutrosophic Cardinality}} \\ &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. \end{aligned}$$

5479

$$\begin{aligned} G_{\text{Neutrosophic Vertex-Decomposition}} &= \\ &\{N_{\text{Neutrosophic SuperHyperNeighborhood}} \\ &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\ &|N_{\text{Neutrosophic SuperHyperNeighborhood}}|_{\text{Neutrosophic Cardinality}} \\ &= \max_{[z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}}} z_{\text{Neutrosophic Number}} \\ &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}. \end{aligned}$$

$$\begin{aligned}
 G_{\text{Neutrosophic Vertex-Decomposition}} &= \\
 &\{N_{\text{Neutrosophic SuperHyperNeighborhood}} \\
 &\in \cup_{z_{\text{Neutrosophic Number}}} [z_{\text{Neutrosophic Number}}]_{\text{Neutrosophic Class}} \mid \\
 &|N_{\text{Neutrosophic SuperHyperSet}}|_{\text{Neutrosophic Cardinality}} \\
 &= \max \{|E| \mid E \in E_{ESHG:(V,E)}\}.
 \end{aligned}$$

Thus, in a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . The all interior Neutrosophic SuperHyperVertices belong to any Neutrosophic quasi-R-Vertex-Decomposition if for any of them, and any of other corresponded Neutrosophic SuperHyperVertex, some interior Neutrosophic SuperHyperVertices are mutually Neutrosophic SuperHyperNeighbors with no Neutrosophic exception at all minus all Neutrosophic SuperHyperNeighbors to any amount of them.

To make sense with the precise words in the terms of “R-”, the follow-up illustrations are coming up.

The following Neutrosophic SuperHyperSet of Neutrosophic SuperHyperVertices is the simple Neutrosophic type-SuperHyperSet of the Neutrosophic R-Vertex-Decomposition.

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

The Neutrosophic SuperHyperSet of Neutrosophic SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

Is the simple Neutrosophic type-SuperHyperSet of the Neutrosophic R-Vertex-Decomposition. The Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

Is an **Neutrosophic R-Vertex-Decomposition**  $\mathcal{C}(ESHG)$  for an Neutrosophic SuperHyper-Graph  $ESHG : (V, E)$  is a Neutrosophic type-SuperHyperSet with

**the maximum Neutrosophic cardinality** of a Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperVertices such that there’s no a Neutrosophic SuperHyperEdge amid some Neutrosophic SuperHyperVertices instead of all given by **Neutrosophic Vertex-Decomposition** is related to the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

There’s not only **one** Neutrosophic SuperHyperVertex **inside** the intended Neutrosophic SuperHyperSet. Thus the non-obvious Neutrosophic Vertex-Decomposition is up. The obvious simple Neutrosophic type-SuperHyperSet called the Neutrosophic Vertex-Decomposition is a Neutrosophic SuperHyperSet **includes** only **one** Neutrosophic SuperHyperVertex. But the Neutrosophic SuperHyperSet of Neutrosophic SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}}.$$

doesn't have less than two SuperHyperVertices **inside** the intended Neutrosophic SuperHyperSet since they've come from at least so far an SuperHyperEdge. Thus the non-obvious simple Neutrosophic type-SuperHyperSet of the Neutrosophic R-Vertex-Decomposition **is** up. To sum them up, the Neutrosophic SuperHyperSet of Neutrosophic SuperHyperVertices,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG}:(V,E) \mid |E|=\max\{|E| \mid E \in E_{ESHG}:(V,E)\}} \}.$$

**Is** the non-obvious simple Neutrosophic type-SuperHyperSet of the Neutrosophic R-Vertex-Decomposition. Since the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices,

$$(V \setminus V \setminus \{x, z\}) \cup \{xy\}$$

or

$$(V \setminus V \setminus \{x, z\}) \cup \{zy\}$$

is an Neutrosophic R-Vertex-Decomposition  $\mathcal{C}(ESHG)$  for an Neutrosophic SuperHyperGraph  $ESHG : (V, E)$  is the Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperVertices such that there's no a Neutrosophic SuperHyperEdge for some Neutrosophic SuperHyperVertices instead of all given by that Neutrosophic type-SuperHyperSet called the Neutrosophic Vertex-Decomposition **and** it's an Neutrosophic **Vertex-Decomposition**. Since it's

**the maximum Neutrosophic cardinality** of a Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperVertices such that there's no a Neutrosophic SuperHyperEdge for some amount Neutrosophic SuperHyperVertices instead of all given by that Neutrosophic type-SuperHyperSet called the Neutrosophic Vertex-Decomposition. There isn't only less than two Neutrosophic SuperHyperVertices **inside** the intended Neutrosophic SuperHyperSet,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG}:(V,E) \mid |E|=\max\{|E| \mid E \in E_{ESHG}:(V,E)\}} \}.$$

Thus the non-obvious Neutrosophic R-Vertex-Decomposition,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG}:(V,E) \mid |E|=\max\{|E| \mid E \in E_{ESHG}:(V,E)\}} \}.$$

is up. The non-obvious simple Neutrosophic type-SuperHyperSet of the Neutrosophic Vertex-Decomposition, not:

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG}:(V,E) \mid |E|=\max\{|E| \mid E \in E_{ESHG}:(V,E)\}} \}.$$

Is the Neutrosophic SuperHyperSet, not:

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG}:(V,E) \mid |E|=\max\{|E| \mid E \in E_{ESHG}:(V,E)\}} \}.$$

does includes only less than two SuperHyperVertices in a connected Neutrosophic Super- 5481  
HyperGraph  $ESHG : (V, E)$  but it's impossible in the case, they've corresponded to an 5482  
SuperHyperEdge. It's interesting to mention that the only non-obvious simple Neutrosophic 5483  
type-SuperHyperSet called the 5484

### **“Neutrosophic R-Vertex-Decomposition”**

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amid those obvious[non-obvious] simple Neutrosophic type-SuperHyperSets called the

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### Neutrosophic R-Vertex-Decomposition,

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is only and only

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

In a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$  with a illustrated SuperHyper-Modeling. It's also, not only a Neutrosophic free-triangle embedded SuperHyperModel and a Neutrosophic on-triangle embedded SuperHyperModel but also it's a Neutrosophic stable embedded SuperHyperModel. But all only non-obvious simple Neutrosophic type-SuperHyperSets of the Neutrosophic R-Vertex-Decomposition amid those obvious simple Neutrosophic type-SuperHyperSets of the Neutrosophic Vertex-Decomposition, are

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

In a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ .

To sum them up, assume a connected loopless Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . Then in the worst case, literally,

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

is a Neutrosophic R-Vertex-Decomposition. In other words, the least cardinality, the lower sharp bound for the cardinality, of a Neutrosophic R-Vertex-Decomposition is the cardinality of

$$V \setminus V \setminus \{a_E, b_E, c_E, \dots\}_{E=\{E \in E_{ESHG:(V,E)} \mid |E|=\max\{|E| \mid E \in E_{ESHG:(V,E)}\}\}} \cdot$$

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To sum them up, in a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . The all interior Neutrosophic SuperHyperVertices belong to any Neutrosophic quasi-R-Vertex-Decomposition if for any of them, and any of other corresponded Neutrosophic SuperHyperVertex, some interior Neutrosophic SuperHyperVertices are mutually Neutrosophic SuperHyperNeighbors with no Neutrosophic exception at all minus all Neutrosophic SuperHyperNeighbors to any amount of them.

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Assume a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . Let a Neutrosophic SuperHyperEdge  $ESHE : E \in E_{ESHG:(V,E)}$  has some Neutrosophic SuperHyperVertices  $r$ . Consider all Neutrosophic numbers of those Neutrosophic SuperHyperVertices from that Neutrosophic SuperHyperEdge excluding excluding more than  $r$  distinct Neutrosophic SuperHyperVertices, exclude to any given Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices. Consider there's a Neutrosophic R-Vertex-Decomposition with the least cardinality, the lower sharp Neutrosophic bound for Neutrosophic cardinality. Assume a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . The Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices  $V_{ESHE} \setminus \{z\}$  is a Neutrosophic SuperHyperSet  $S$  of the Neutrosophic SuperHyperVertices such that there's a Neutrosophic SuperHyperEdge to have some Neutrosophic SuperHyperVertices uniquely but it isn't a Neutrosophic R-Vertex-Decomposition. Since it doesn't have

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**the maximum Neutrosophic cardinality** of a Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperVertices such that there's a Neutrosophic SuperHyperEdge to have some SuperHyperVertices uniquely. The Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices  $V_{ESHE} \cup \{z\}$  is the maximum Neutrosophic cardinality of a Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperVertices but it isn't a Neutrosophic R-Vertex-Decomposition. Since it **doesn't do** the Neutrosophic procedure such that there's a Neutrosophic SuperHyperEdge to have some Neutrosophic SuperHyperVertices uniquely [there are at least one Neutrosophic SuperHyperVertex outside implying there's, sometimes in the connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ , a Neutrosophic SuperHyperVertex, titled its Neutrosophic SuperHyperNeighbor, to that Neutrosophic SuperHyperVertex in the Neutrosophic SuperHyperSet  $S$  so as  $S$  doesn't do "the Neutrosophic procedure"]. There's only **one** Neutrosophic SuperHyperVertex **outside** the intended Neutrosophic SuperHyperSet,  $V_{ESHE} \cup \{z\}$ , in the terms of Neutrosophic SuperHyperNeighborhood. Thus the obvious Neutrosophic R-Vertex-Decomposition,  $V_{ESHE}$  is up. The obvious simple Neutrosophic type-SuperHyperSet of the Neutrosophic R-Vertex-Decomposition,  $V_{ESHE}$ , **is** a Neutrosophic SuperHyperSet,  $V_{ESHE}$ , **includes** only **all** Neutrosophic SuperHyperVertices does forms any kind of Neutrosophic pairs are titled Neutrosophic SuperHyperNeighbors in a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . Since the Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperVertices  $V_{ESHE}$ , is the **maximum Neutrosophic SuperHyperCardinality** of a Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperVertices **such that** there's a Neutrosophic SuperHyperEdge to have some Neutrosophic SuperHyperVertices uniquely. Thus, in a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ . Any Neutrosophic R-Vertex-Decomposition only contains all interior Neutrosophic SuperHyperVertices and all exterior Neutrosophic SuperHyperVertices from the unique Neutrosophic SuperHyperEdge where there's any of them has all possible Neutrosophic SuperHyperNeighbors in and there's all Neutrosophic SuperHyperNeighborhoods in with no exception minus all Neutrosophic SuperHyperNeighbors to some of them not all of them but everything is possible about Neutrosophic SuperHyperNeighborhoods and Neutrosophic SuperHyperNeighbors out. The SuperHyperNotion, namely, Vertex-Decomposition, is up. There's neither empty SuperHyperEdge nor loop SuperHyperEdge. The following Neutrosophic SuperHyperSet of Neutrosophic SuperHyperEdges[SuperHyperVertices] is the simple Neutrosophic type-SuperHyperSet of the Neutrosophic Vertex-Decomposition. The Neutrosophic SuperHyperSet of Neutrosophic SuperHyperEdges[SuperHyperVertices],

$$\begin{aligned} & \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-Decomposition} \\ &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{2} \rfloor}. \\ & \mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial} \\ &= 2z^{\lfloor \frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{2} \rfloor}. \\ & \mathcal{C}(NSHG)_{NeutrosophicR-Quasi-Vertex-Decomposition} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\ & \mathcal{C}(NSHG)_{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial} = az^s + bz^t. \end{aligned}$$

is the simple Neutrosophic type-SuperHyperSet of the Neutrosophic Vertex-Decomposition. The Neutrosophic SuperHyperSet of the Neutrosophic SuperHyperEdges[SuperHyperVertices],

$$\mathcal{C}(NSHG)_{NeutrosophicQuasi-Vertex-Decomposition}$$



$$\begin{aligned}
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
 \end{aligned}$$

Is an **Neutrosophic Vertex-Decomposition**  $\mathcal{C}(ESHG)$  for an Neutrosophic SuperHyper- 5543  
Graph  $ESHG : (V, E)$  is a Neutrosophic type-SuperHyperSet with 5544

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**the maximum Neutrosophic cardinality** of a Neutrosophic SuperHyperSet  $S$  of Neut- 5546  
rosophic SuperHyperEdges[SuperHyperVertices] such that there's no Neutrosophic Super- 5547  
HyperVertex of a Neutrosophic SuperHyperEdge is common and there's an Neutrosophic 5548  
SuperHyperEdge for all Neutrosophic SuperHyperVertices. There are not only **two** Neut- 5549  
rosophic SuperHyperVertices **inside** the intended Neutrosophic SuperHyperSet. Thus the 5550  
non-obvious Neutrosophic Vertex-Decomposition is up. The obvious simple Neutrosophic type- 5551  
SuperHyperSet called the Neutrosophic Vertex-Decomposition is a Neutrosophic SuperHyperSet 5552  
**includes** only **two** Neutrosophic SuperHyperVertices. But the Neutrosophic SuperHyperSet of 5553  
the Neutrosophic SuperHyperEdges[SuperHyperVertices], 5554

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
 \end{aligned}$$

Doesn't have less than three SuperHyperVertices **inside** the intended Neutrosophic SuperHy- 5555  
perSet. Thus the non-obvious simple Neutrosophic type-SuperHyperSet of the Neutrosophic 5556  
Vertex-Decomposition **is** up. To sum them up, the Neutrosophic SuperHyperSet of the Neutro- 5557  
sophic SuperHyperEdges[SuperHyperVertices], 5558

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}} \\
 &= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
 &= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t. \\
 &\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
 \end{aligned}$$

**Is** the non-obvious simple Neutrosophic type-SuperHyperSet of the Neutrosophic Vertex- 5559  
Decomposition. Since the Neutrosophic SuperHyperSet of the Neutrosophic SuperHy- 5560  
perEdges[SuperHyperVertices], 5561

$$\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}}$$

$$\begin{aligned}
&= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
&= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
\end{aligned}$$

Is an Neutrosophic Vertex-Decomposition  $\mathcal{C}(ESHG)$  for an Neutrosophic SuperHyperGraph  $ESHG : (V, E)$  is the Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperVertices such that there's no Neutrosophic SuperHyperEdge for some Neutrosophic SuperHyperVertices given by that Neutrosophic type-SuperHyperSet called the Neutrosophic Vertex-Decomposition and it's an Neutrosophic Vertex-Decomposition. Since it's

the maximum Neutrosophic cardinality of a Neutrosophic SuperHyperSet  $S$  of Neutrosophic SuperHyperEdges[SuperHyperVertices] such that there's no Neutrosophic SuperHyperVertex of a Neutrosophic SuperHyperEdge is common and there's an Neutrosophic SuperHyperEdge for all Neutrosophic SuperHyperVertices. There aren't only less than three Neutrosophic SuperHyperVertices inside the intended Neutrosophic SuperHyperSet,

$$\begin{aligned}
&\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}} \\
&= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
&= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
\end{aligned}$$

Thus the non-obvious Neutrosophic Vertex-Decomposition,

$$\begin{aligned}
&\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}} \\
&= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}} \\
&= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.
\end{aligned}$$

Is up. The obvious simple Neutrosophic type-SuperHyperSet of the Neutrosophic Vertex-Decomposition, not:

$$\begin{aligned}
&\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}} \\
&= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor} \\
&\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}}
\end{aligned}$$

$$= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor}.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.$$

Is the Neutrosophic SuperHyperSet, not:

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$$\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}}$$

$$= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor}.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}}$$

$$= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor}.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.$$

Does includes only less than three SuperHyperVertices in a connected Neutrosophic Super- 5577  
HyperGraph  $ESHG : (V, E)$ . It's interesting to mention that the only non-obvious simple 5578  
Neutrosophic type-SuperHyperSet called the 5579

### “Neutrosophic Vertex-Decomposition”

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amid those obvious[non-obvious] simple Neutrosophic type-SuperHyperSets called the 5581

### Neutrosophic Vertex-Decomposition,

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is only and only 5583

$$\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-Decomposition}}$$

$$= \{E_{2i-1}\}_{i=1}^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor}.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicQuasi-Vertex-DecompositionSuperHyperPolynomial}}$$

$$= 2z^{\lfloor \frac{|ESHG:(V,E)| \text{Neutrosophic Cardinality}}{2} \rfloor}.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-Decomposition}} = \{V_i\}_{i=1}^s, \{V_j\}_{j=1}^t.$$

$$\mathcal{C}(NSHG)_{\text{NeutrosophicR-Quasi-Vertex-DecompositionSuperHyperPolynomial}} = az^s + bz^t.$$

In a connected Neutrosophic SuperHyperGraph  $ESHG : (V, E)$ .

■ 5584

# The Neutrosophic Departures on The Theoretical Results Toward Theoretical Motivations

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The previous Neutrosophic approach apply on the upcoming Neutrosophic results on Neutrosophic SuperHyperClasses.

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**Proposition 31.0.1.** Assume a connected Neutrosophic SuperHyperPath  $ESHG : (V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\
 &= \{\{E_i\}_{i \neq 1, |E_{NSHG}|}, \{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\
 &= \sum_{i \neq 1, |E_{NSHG}|} z^{|E_i|} + z^0. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\
 &= \{\{V_{E_i}\}_{|E_i|=1}, \{\}\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= \sum_{i \neq 1, |E_{NSHG}|, |E_i|=1} z^{|V_i|} + z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & V_{\frac{|E_{NSHG}|}{3}}^{EXTERNAL}, E_{\frac{|E_{NSHG}|}{3}}
 \end{aligned}$$

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$$\begin{aligned}
 & P : \\
 & E_1, V_1^{EXTERNAL},
 \end{aligned}$$

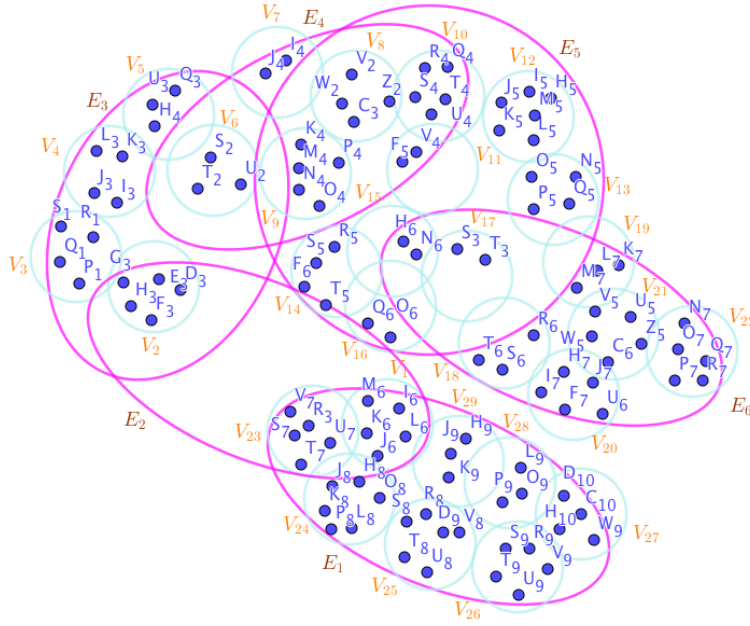


Figure 31.1: a Neutrosophic SuperHyperPath Associated to the Notions of Neutrosophic SuperHyperVertex-Decomposition in the Example (42.0.5)

136NSHG18

$$E_2, V_2^{EXTERNAL},$$

$$\dots,$$

$$E_{\lfloor \frac{|NSHG|}{3} \rfloor}, V_{\lfloor \frac{|NSHG|}{3} \rfloor}^{EXTERNAL}$$

be a longest path taken from a connected Neutrosophic SuperHyperPath  $ESHP : (V, E)$ .  
There's a new way to redefine as

$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded  
to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is  
straightforward. ■

136EXM18a

**Example 31.0.2.** In the Figure (31.1), the connected Neutrosophic SuperHyperPath  $ESHP : (V, E)$ , is highlighted and featured. The Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.1), is the SuperHyperVertex-Decomposition.

**Proposition 31.0.3.** Assume a connected Neutrosophic SuperHyperCycle  $ESHC : (V, E)$ . Then

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}}$$

$$\begin{aligned}
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &V_{\frac{|E_{NSHG}|}{3}}^{EXTERNAL}, E_{\frac{|E_{NSHG}|}{3}}
 \end{aligned}$$

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$$\begin{aligned}
 &P : \\
 &E_1, V_1^{EXTERNAL}, \\
 &E_2, V_2^{EXTERNAL}, \\
 &\dots, \\
 &E_{\frac{|E_{NSHG}|}{3}}, V_{\frac{|E_{NSHG}|}{3}}^{EXTERNAL}
 \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperCycle  $ESHG : (V, E)$ . 5605  
There's a new way to redefine as 5606

$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded 5607  
to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is 5608  
straightforward. ■ 5609

136EXM19a

**Example 31.0.4.** In the Figure (31.2), the connected Neutrosophic SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, in the 5610  
Neutrosophic SuperHyperModel (31.2), is the Neutrosophic SuperHyperVertex-Decomposition. 5611  
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136NSHG20a

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Then

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$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{EXTERNAL}, E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}.
 \end{aligned}$$

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$$\begin{aligned}
 &P : \\
 &E_1, V_1^{EXTERNAL}, \\
 &E_2, V_2^{EXTERNAL}, \\
 &\dots, \\
 &E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}, V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ .

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There's a new way to redefine as

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$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is straightforward. Then there's no at least one SuperHyperVertex-Decomposition. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperVertex-Decomposition could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2
 \end{aligned}$$

136NSHG21a

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136EXM21a

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$$\begin{aligned}
 &= z^0. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic } V\text{-Vertex-Decomposition}} \\
 &= \{\{\}\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic } V\text{-Vertex-Decomposition SuperHyperPolynomial}} \\
 &= z^0.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{EXTERNAL}, E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}.
 \end{aligned}$$

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$$\begin{aligned}
 &P : \\
 &E_1, V_1^{EXTERNAL}, \\
 &E_2, V_2^{EXTERNAL}, \\
 &\dots, \\
 &E_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}, V_{|P_i|=\min_{P_j \in E_{NSHG}} |P_j|}^{EXTERNAL}
 \end{aligned}$$

is a longest SuperHyperVertex-Decomposition taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is straightforward. Then there's no at least one SuperHyperVertex-Decomposition. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperVertex-Decomposition could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2
 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of-SuperHyperPart SuperHyperEdges are attained in any solution

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$$P :$$

136NSHG22a

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . 5663  
The latter is straightforward. 5664

**Example 31.0.10.** In the Figure (31.5), the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , in the Neutrosophic SuperHyperModel (31.5), is the Neutrosophic SuperHyperVertex-Decomposition.

$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition}} \\ &= \{\{\}\}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic V-Vertex-Decomposition SuperHyperPolynomial}} \\ &= z^0. \end{aligned}$$

*Proof.* Let

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1^*, \\ CENTER, E_2^* \end{aligned}$$

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$$\begin{aligned} P : \\ E_1^*, V_1^{EXTERNAL}, \\ E_2^*, CENTER \end{aligned}$$

is a longest SuperHyperVertex-Decomposition taken from a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperVertex-Decomposition. The latter is straightforward. Then there's at least one SuperHyperVertex-Decomposition. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperVertex-Decomposition could be applied. The unique embedded SuperHyperVertex-Decomposition proposes some longest SuperHyperVertex-Decomposition excerpt from some representatives. The latter is straightforward. ■

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**Example 31.0.12.** In the Neutrosophic Figure (31.6), the connected Neutrosophic SuperHyperWheel  $NSHW : (V, E)$ , is Neutrosophic highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ , in the Neutrosophic SuperHyperModel (31.6), is the Neutrosophic SuperHyperVertex-Decomposition.

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136NSHG23a



# The Surveys of Mathematical Sets On The Results But As The Initial Motivation

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For the SuperHyperVertex-Decomposition, Neutrosophic SuperHyperVertex-Decomposition, and the Neutrosophic SuperHyperVertex-Decomposition, some general results are introduced.

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*Remark 32.0.1.* Let remind that the Neutrosophic SuperHyperVertex-Decomposition is “redefined” on the positions of the alphabets.

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**Corollary 32.0.2.** Assume Neutrosophic SuperHyperVertex-Decomposition. Then

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$$\begin{aligned} & \text{Neutrosophic SuperHyperVertex - Decomposition} = \\ & \{ \text{the SuperHyperVertex - Decomposition of the SuperHyperVertices} \mid \\ & \max | \text{SuperHyperOffensive} \\ & \text{SuperHyperVertex - Decomposition} \\ & | \text{Neutrosophic cardinality among those SuperHyperVertex - Decomposition.} \} \end{aligned}$$

plus one Neutrosophic SuperHyperNeighbor to one. Where  $\sigma_i$  is the unary operation on the SuperHyperVertices of the SuperHyperGraph to assign the determinacy, the indeterminacy and the neutrality, for  $i = 1, 2, 3$ , respectively.

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**Corollary 32.0.3.** Assume a Neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then the notion of Neutrosophic SuperHyperVertex-Decomposition and SuperHyperVertex-Decomposition coincide.

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**Corollary 32.0.4.** Assume a Neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then a consequenceNeighborive sequence of the SuperHyperVertices is a Neutrosophic SuperHyperVertex-Decomposition if and only if it's a SuperHyperVertex-Decomposition.

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**Corollary 32.0.5.** Assume a Neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then a consequenceNeighborive sequence of the SuperHyperVertices is a strongest SuperHyperVertex-Decomposition if and only if it's a longest SuperHyperVertex-Decomposition.

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**Corollary 32.0.6.** Assume SuperHyperClasses of a Neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then its Neutrosophic SuperHyperVertex-Decomposition is its SuperHyperVertex-Decomposition and reversely.

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**Corollary 32.0.7.** Assume a Neutrosophic SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel) on the same identical letter of the alphabet. Then its Neutrosophic SuperHyperVertex-Decomposition is its SuperHyperVertex-Decomposition and reversely.

**Corollary 32.0.8.** Assume a Neutrosophic SuperHyperGraph. Then its Neutrosophic SuperHyperVertex-Decomposition isn't well-defined if and only if its SuperHyperVertex-Decomposition isn't well-defined.

**Corollary 32.0.9.** Assume SuperHyperClasses of a Neutrosophic SuperHyperGraph. Then its Neutrosophic SuperHyperVertex-Decomposition isn't well-defined if and only if its SuperHyperVertex-Decomposition isn't well-defined.

**Corollary 32.0.10.** Assume a Neutrosophic SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). Then its Neutrosophic SuperHyperVertex-Decomposition isn't well-defined if and only if its SuperHyperVertex-Decomposition isn't well-defined.

**Corollary 32.0.11.** Assume a Neutrosophic SuperHyperGraph. Then its Neutrosophic SuperHyperVertex-Decomposition is well-defined if and only if its SuperHyperVertex-Decomposition is well-defined.

**Corollary 32.0.12.** Assume SuperHyperClasses of a Neutrosophic SuperHyperGraph. Then its Neutrosophic SuperHyperVertex-Decomposition is well-defined if and only if its SuperHyperVertex-Decomposition is well-defined.

**Corollary 32.0.13.** Assume a Neutrosophic SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). Then its Neutrosophic SuperHyperVertex-Decomposition is well-defined if and only if its SuperHyperVertex-Decomposition is well-defined.

**Proposition 32.0.14.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph. Then  $V$  is

- (i) : the dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (ii) : the strong dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iii) : the connected dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iv) : the  $\delta$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (v) : the strong  $\delta$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition;
- (vi) : the connected  $\delta$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition.

**Proposition 32.0.15.** Let  $NTG : (V, E, \sigma, \mu)$  be a Neutrosophic SuperHyperGraph. Then  $\emptyset$  is

- (i) : the SuperHyperDefensive SuperHyperVertex-Decomposition;
- (ii) : the strong SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iii) : the connected defensive SuperHyperDefensive SuperHyperVertex-Decomposition;
- (iv) : the  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition;

(v) : the strong  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5749

(vi) : the connected  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 5750

**Proposition 32.0.16.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph. Then an independent SuperHyperSet is 5751  
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(i) : the SuperHyperDefensive SuperHyperVertex-Decomposition; 5753

(ii) : the strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5754

(iii) : the connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5755

(iv) : the  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5756

(v) : the strong  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5757

(vi) : the connected  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 5758

**Proposition 32.0.17.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperUniform SuperHyper- 5759  
Graph which is a SuperHyperVertex-Decomposition/SuperHyperPath. Then  $V$  is a maximal 5760

(i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 5761

(ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5762

(iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5763

(iv) :  $\mathcal{O}(ESHG)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5764

(v) : strong  $\mathcal{O}(ESHG)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5765

(vi) : connected  $\mathcal{O}(ESHG)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5766

Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 5767

**Proposition 32.0.18.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph which is a 5768  
SuperHyperUniform SuperHyperWheel. Then  $V$  is a maximal 5769

(i) : dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5770

(ii) : strong dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5771

(iii) : connected dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5772

(iv) :  $\mathcal{O}(ESHG)$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5773

(v) : strong  $\mathcal{O}(ESHG)$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5774

(vi) : connected  $\mathcal{O}(ESHG)$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5775

Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 5776

**Proposition 32.0.19.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperUniform SuperHy- 5777  
perGraph which is a SuperHyperVertex-Decomposition/SuperHyperPath. Then the number 5778  
of 5779

- (i) : the SuperHyperVertex-Decomposition; 5780
- (ii) : the SuperHyperVertex-Decomposition; 5781
- (iii) : the connected SuperHyperVertex-Decomposition; 5782
- (iv) : the  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 5783
- (v) : the strong  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 5784
- (vi) : the connected  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition. 5785

is one and it's only  $V$ . Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 5786  
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**Proposition 32.0.20.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperUniform SuperHyper- 5788  
Graph which is a SuperHyperWheel. Then the number of 5789

- (i) : the dual SuperHyperVertex-Decomposition; 5790
- (ii) : the dual SuperHyperVertex-Decomposition; 5791
- (iii) : the dual connected SuperHyperVertex-Decomposition; 5792
- (iv) : the dual  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 5793
- (v) : the strong dual  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition; 5794
- (vi) : the connected dual  $\mathcal{O}(ESHG)$ -SuperHyperVertex-Decomposition. 5795

is one and it's only  $V$ . Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 5796  
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**Proposition 32.0.21.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperUniform SuperHy- 5798  
perGraph which is a SuperHyperStar/SuperHyperComplete SuperHyperBipartite/SuperHyper- 5799  
Complete SuperHyperMultipartite. Then a SuperHyperSet contains [the SuperHyperCenter 5800  
and] the half of multiplying  $r$  with the number of all the SuperHyperEdges plus one of all the 5801  
SuperHyperVertices is a 5802

- (i) : dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5803
- (ii) : strong dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5804
- (iii) : connected dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5805
- (iv) :  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5806
- (v) : strong  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5807
- (vi) : connected  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition. 5808

**Proposition 32.0.22.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperUniform SuperHyper- 5809  
Graph which is a SuperHyperStar/SuperHyperComplete SuperHyperBipartite/SuperHyperCom- 5810  
plete SuperHyperMultipartite. Then a SuperHyperSet contains the half of multiplying  $r$  with 5811  
the number of all the SuperHyperEdges plus one of all the SuperHyperVertices in the biggest 5812  
SuperHyperPart is a 5813

- (i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 5814
- (ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5815
- (iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5816
- (iv) :  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5817
- (v) : strong  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5818
- (vi) : connected  $\delta$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 5819

**Proposition 32.0.23.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperUniform SuperHyper- 5820  
Graph which is a SuperHyperStar/SuperHyperComplete SuperHyperBipartite/SuperHyperCom- 5821  
plete SuperHyperMultipartite. Then Then the number of 5822

- (i) : dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5823
- (ii) : strong dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5824
- (iii) : connected dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5825
- (iv) :  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5826
- (v) : strong  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5827
- (vi) : connected  $\frac{\mathcal{O}(ESHG)}{2} + 1$ -dual SuperHyperDefensive SuperHyperVertex-Decomposition. 5828

is one and it's only  $S$ , a SuperHyperSet contains [the SuperHyperCenter and] the half of 5829  
multiplying  $r$  with the number of all the SuperHyperEdges plus one of all the SuperHyperVertices. 5830  
Where the exterior SuperHyperVertices and the interior SuperHyperVertices coincide. 5831

**Proposition 32.0.24.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph. The number of 5832  
connected component is  $|V - S|$  if there's a SuperHyperSet which is a dual 5833

- (i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 5834
- (ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5835
- (iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5836
- (iv) : SuperHyperVertex-Decomposition; 5837
- (v) : strong 1-SuperHyperDefensive SuperHyperVertex-Decomposition; 5838
- (vi) : connected 1-SuperHyperDefensive SuperHyperVertex-Decomposition. 5839

**Proposition 32.0.25.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph. Then the number is at most  $\mathcal{O}(ESHG)$  and the Neutrosophic number is at most  $\mathcal{O}_n(ESHG)$ . 5840  
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**Proposition 32.0.26.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph which is SuperHyperComplete. The number is  $\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1$  and the Neutrosophic number is  $\min \sum_{v \in \{v_1, v_2, \dots, v_t\}} \frac{\mathcal{O}(ESHG:(V,E))}{2} \subseteq V \sigma(v)$ , in the setting of dual 5842  
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- (i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 5845
- (ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5846
- (iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5847
- (iv) :  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5848
- (v) : strong  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5849
- (vi) : connected  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 5850

**Proposition 32.0.27.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph which is  $\emptyset$ . The number is 0 and the Neutrosophic number is 0, for an independent SuperHyperSet in the setting of dual 5851  
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- (i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 5854
- (ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5855
- (iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5856
- (iv) : 0-SuperHyperDefensive SuperHyperVertex-Decomposition; 5857
- (v) : strong 0-SuperHyperDefensive SuperHyperVertex-Decomposition; 5858
- (vi) : connected 0-SuperHyperDefensive SuperHyperVertex-Decomposition. 5859

**Proposition 32.0.28.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph which is SuperHyperComplete. Then there's no independent SuperHyperSet. 5860  
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**Proposition 32.0.29.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph which is SuperHyperVertex-Decomposition/SuperHyperPath/SuperHyperWheel. The number is  $\mathcal{O}(ESHG : (V, E))$  and the Neutrosophic number is  $\mathcal{O}_n(ESHG : (V, E))$ , in the setting of a dual 5862  
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- (i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 5866
- (ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5867
- (iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5868
- (iv) :  $\mathcal{O}(ESHG : (V, E))$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5869
- (v) : strong  $\mathcal{O}(ESHG : (V, E))$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5870

(vi) : connected  $\mathcal{O}(ESHG : (V, E))$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 5871

**Proposition 32.0.30.** Let  $ESHG : (V, E)$  be a Neutrosophic SuperHyperGraph which is SuperHyperStar/complete SuperHyperBipartite/complete SuperHyperMultiPartite. The number is  $\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1$  and the Neutrosophic number is  $\min \Sigma_{v \in \{v_1, v_2, \dots, v_t\}} \subseteq V \sigma(v)$ , in the setting of a dual 5872  
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(i) : SuperHyperDefensive SuperHyperVertex-Decomposition; 5876

(ii) : strong SuperHyperDefensive SuperHyperVertex-Decomposition; 5877

(iii) : connected SuperHyperDefensive SuperHyperVertex-Decomposition; 5878

(iv) :  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5879

(v) : strong  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5880

(vi) : connected  $(\frac{\mathcal{O}(ESHG:(V,E))}{2} + 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 5881

**Proposition 32.0.31.** Let  $\mathcal{NSHF} : (V, E)$  be a SuperHyperFamily of the  $ESHGs : (V, E)$  Neutrosophic SuperHyperGraphs which are from one-type SuperHyperClass which the result is obtained for the individuals. Then the results also hold for the SuperHyperFamily  $\mathcal{NSHF} : (V, E)$  of these specific SuperHyperClasses of the Neutrosophic SuperHyperGraphs. 5882  
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**Proposition 32.0.32.** Let  $ESHG : (V, E)$  be a strong Neutrosophic SuperHyperGraph. If  $S$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition, then  $\forall v \in V \setminus S, \exists x \in S$  such that 5886  
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(i)  $v \in N_s(x)$ ; 5888

(ii)  $vx \in E$ . 5889

**Proposition 32.0.33.** Let  $ESHG : (V, E)$  be a strong Neutrosophic SuperHyperGraph. If  $S$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition, then 5890  
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(i)  $S$  is SuperHyperVertex-Decomposition set; 5892

(ii) there's  $S \subseteq S'$  such that  $|S'|$  is SuperHyperChromatic number. 5893

**Proposition 32.0.34.** Let  $ESHG : (V, E)$  be a strong Neutrosophic SuperHyperGraph. Then 5894

(i)  $\Gamma \leq \mathcal{O}$ ; 5895

(ii)  $\Gamma_s \leq \mathcal{O}_n$ . 5896

**Proposition 32.0.35.** Let  $ESHG : (V, E)$  be a strong Neutrosophic SuperHyperGraph which is connected. Then 5897  
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(i)  $\Gamma \leq \mathcal{O} - 1$ ; 5899

(ii)  $\Gamma_s \leq \mathcal{O}_n - \Sigma_{i=1}^3 \sigma_i(x)$ . 5900

**Proposition 32.0.36.** Let  $ESHG : (V, E)$  be an odd SuperHyperPath. Then 5901



- (i) the SuperHyperSet  $S = \{v_2, v_4, \dots, v_{n-1}\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5902  
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- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$  and corresponded SuperHyperSet is  $S = \{v_2, v_4, \dots, v_{n-1}\}$ ; 5904
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s)\}$ ; 5905
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_{n-1}\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only a dual SuperHyperVertex-Decomposition. 5906  
5907
- Proposition 32.0.37.** Let  $ESHG : (V, E)$  be an even SuperHyperPath. Then 5908
- (i) the set  $S = \{v_2, v_4, \dots, v_n\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5909  
5910
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$  and corresponded SuperHyperSets are  $\{v_2, v_4, \dots, v_n\}$  and  $\{v_1, v_3, \dots, v_{n-1}\}$ ; 5911
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_n\}} \sum_{i=1}^3 \sigma_i(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s)\}$ ; 5912
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_n\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only dual SuperHyperVertex-Decomposition. 5913  
5914
- Proposition 32.0.38.** Let  $ESHG : (V, E)$  be an even SuperHyperVertex-Decomposition. Then 5915
- (i) the SuperHyperSet  $S = \{v_2, v_4, \dots, v_n\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5916  
5917
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$  and corresponded SuperHyperSets are  $\{v_2, v_4, \dots, v_n\}$  and  $\{v_1, v_3, \dots, v_{n-1}\}$ ; 5918
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_n\}} \sigma(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sigma(s)\}$ ; 5919
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_n\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only dual SuperHyperVertex-Decomposition. 5920  
5921
- Proposition 32.0.39.** Let  $ESHG : (V, E)$  be an odd SuperHyperVertex-Decomposition. Then 5922
- (i) the SuperHyperSet  $S = \{v_2, v_4, \dots, v_{n-1}\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5923  
5924
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$  and corresponded SuperHyperSet is  $S = \{v_2, v_4, \dots, v_{n-1}\}$ ; 5925
- (iii)  $\Gamma_s = \min\{\sum_{s \in S = \{v_2, v_4, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s), \sum_{s \in S = \{v_1, v_3, \dots, v_{n-1}\}} \sum_{i=1}^3 \sigma_i(s)\}$ ; 5926
- (iv) the SuperHyperSets  $S_1 = \{v_2, v_4, \dots, v_{n-1}\}$  and  $S_2 = \{v_1, v_3, \dots, v_{n-1}\}$  are only dual SuperHyperVertex-Decomposition. 5927  
5928
- Proposition 32.0.40.** Let  $ESHG : (V, E)$  be SuperHyperStar. Then 5929
- (i) the SuperHyperSet  $S = \{c\}$  is a dual maximal SuperHyperVertex-Decomposition; 5930
- (ii)  $\Gamma = 1$ ; 5931
- (iii)  $\Gamma_s = \sum_{i=1}^3 \sigma_i(c)$ ; 5932

(iv) the SuperHyperSets  $S = \{c\}$  and  $S \subset S'$  are only dual SuperHyperVertex-Decomposition. 5933

**Proposition 32.0.41.** Let  $ESHG : (V, E)$  be SuperHyperWheel. Then 5934

(i) the SuperHyperSet  $S = \{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}$  is a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition; 5935

(ii)  $\Gamma = |\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}|$ ; 5937

(iii)  $\Gamma_s = \sum_{\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}} \sum_{i=1}^3 \sigma_i(s)$ ; 5938

(iv) the SuperHyperSet  $\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1) \leq n}$  is only a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition. 5940

**Proposition 32.0.42.** Let  $ESHG : (V, E)$  be an odd SuperHyperComplete. Then 5941

(i) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5942

(ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$ ; 5944

(iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}}$ ; 5945

(iv) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  is only a dual SuperHyperDefensive SuperHyperVertex-Decomposition. 5946

**Proposition 32.0.43.** Let  $ESHG : (V, E)$  be an even SuperHyperComplete. Then 5948

(i) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition; 5949

(ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$ ; 5951

(iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}}$ ; 5952

(iv) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  is only a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition. 5953

**Proposition 32.0.44.** Let  $\mathcal{NSHF} : (V, E)$  be a  $m$ -SuperHyperFamily of Neutrosophic SuperHyperStars with common Neutrosophic SuperHyperVertex SuperHyperSet. Then 5955

(i) the SuperHyperSet  $S = \{c_1, c_2, \cdots, c_m\}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition for  $\mathcal{NSHF}$ ; 5957

(ii)  $\Gamma = m$  for  $\mathcal{NSHF} : (V, E)$ ; 5959

(iii)  $\Gamma_s = \sum_{i=1}^m \sum_{j=1}^3 \sigma_j(c_i)$  for  $\mathcal{NSHF} : (V, E)$ ; 5960

(iv) the SuperHyperSets  $S = \{c_1, c_2, \cdots, c_m\}$  and  $S \subset S'$  are only dual SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ . 5961



**Proposition 32.0.45.** Let  $\mathcal{NSHF} : (V, E)$  be an  $m$ -SuperHyperFamily of odd SuperHyperComplete SuperHyperGraphs with common Neutrosophic SuperHyperVertex SuperHyperSet. Then

- (i) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  is a dual maximal SuperHyperDefensive SuperHyperVertex-Decomposition for  $\mathcal{NSHF}$ ; 5963  
5966
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$  for  $\mathcal{NSHF} : (V, E)$ ; 5967
- (iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}}$  for  $\mathcal{NSHF} : (V, E)$ ; 5968
- (iv) the SuperHyperSets  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor + 1}$  are only a dual maximal SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ . 5969  
5970

**Proposition 32.0.46.** Let  $\mathcal{NSHF} : (V, E)$  be a  $m$ -SuperHyperFamily of even SuperHyperComplete SuperHyperGraphs with common Neutrosophic SuperHyperVertex SuperHyperSet. Then

- (i) the SuperHyperSet  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  is a dual SuperHyperDefensive SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ ; 5973  
5974
- (ii)  $\Gamma = \lfloor \frac{n}{2} \rfloor$  for  $\mathcal{NSHF} : (V, E)$ ; 5975
- (iii)  $\Gamma_s = \min\{\sum_{s \in S} \sum_{i=1}^3 \sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}}$  for  $\mathcal{NSHF} : (V, E)$ ; 5976
- (iv) the SuperHyperSets  $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$  are only dual maximal SuperHyperVertex-Decomposition for  $\mathcal{NSHF} : (V, E)$ . 5977  
5978

**Proposition 32.0.47.** Let  $ESHG : (V, E)$  be a strong Neutrosophic SuperHyperGraph. Then following statements hold; 5979  
5980

- (i) if  $s \geq t$  and a SuperHyperSet  $S$  of SuperHyperVertices is an  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is an  $s$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 5981  
5982  
5983
- (ii) if  $s \leq t$  and a SuperHyperSet  $S$  of SuperHyperVertices is a dual  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is a dual  $s$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 5984  
5985  
5986

**Proposition 32.0.48.** Let  $ESHG : (V, E)$  be a strong Neutrosophic SuperHyperGraph. Then following statements hold; 5987  
5988

- (i) if  $s \geq t + 2$  and a SuperHyperSet  $S$  of SuperHyperVertices is an  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is an  $s$ -SuperHyperPowerful SuperHyperVertex-Decomposition; 5989  
5990  
5991
- (ii) if  $s \leq t$  and a SuperHyperSet  $S$  of SuperHyperVertices is a dual  $t$ -SuperHyperDefensive SuperHyperVertex-Decomposition, then  $S$  is a dual  $s$ -SuperHyperPowerful SuperHyperVertex-Decomposition. 5992  
5993  
5994

**Proposition 32.0.49.** Let  $ESHG : (V, E)$  be a  $[an]$   $[V-]$ SuperHyperUniform-strong-Neutrosophic SuperHyperGraph. Then following statements hold; 5995  
5996

- (i) if  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{r}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 5997  
5998
- (ii) if  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{r}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 5999  
6000
- (iii) if  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is an V-SuperHyperDefensive SuperHyperVertex-Decomposition; 6001  
6002
- (iv) if  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is a dual V-SuperHyperDefensive SuperHyperVertex-Decomposition. 6003  
6004
- Proposition 32.0.50.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Neutrosophic SuperHyperGraph. Then following statements hold; 6005  
6006
- (i)  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{r}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 6007  
6008
- (ii)  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{r}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 6009  
6010
- (iii)  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is an V-SuperHyperDefensive SuperHyperVertex-Decomposition; 6011  
6012
- (iv)  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is a dual V-SuperHyperDefensive SuperHyperVertex-Decomposition. 6013  
6014
- Proposition 32.0.51.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Neutrosophic SuperHyperGraph which is a SuperHyperComplete. Then following statements hold; 6015  
6016
- (i)  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 6017  
6018
- (ii)  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 6019  
6020
- (iii)  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is an  $(\mathcal{O} - 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 6021  
6022
- (iv)  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is a dual  $(\mathcal{O} - 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition. 6023  
6024
- Proposition 32.0.52.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Neutrosophic SuperHyperGraph which is a SuperHyperComplete. Then following statements hold; 6025  
6026
- (i) if  $\forall a \in S, |N_s(a) \cap S| < \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 6027  
6028
- (ii) if  $\forall a \in V \setminus S, |N_s(a) \cap S| > \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive SuperHyperVertex-Decomposition; 6029  
6030
- (iii) if  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is  $(\mathcal{O} - 1)$ -SuperHyperDefensive SuperHyperVertex-Decomposition; 6031  
6032

(iv) if  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is a dual  $(\mathcal{O} - 1)$ -  
SuperHyperDefensive SuperHyperVertex-Decomposition. 6033  
6034

**Proposition 32.0.53.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Neutrosophic  
SuperHyperGraph which is SuperHyperVertex-Decomposition. Then following statements hold; 6035  
6036

(i)  $\forall a \in S, |N_s(a) \cap S| < 2$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive SuperHyperVertex-  
Decomposition; 6037  
6038

(ii)  $\forall a \in V \setminus S, |N_s(a) \cap S| > 2$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
SuperHyperVertex-Decomposition; 6039  
6040

(iii)  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is an 2-SuperHyperDefensive  
SuperHyperVertex-Decomposition; 6041  
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(iv)  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$  if  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
SuperHyperVertex-Decomposition. 6043  
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**Proposition 32.0.54.** Let  $ESHG : (V, E)$  is a[an] [V-]SuperHyperUniform-strong-Neutrosophic  
SuperHyperGraph which is SuperHyperVertex-Decomposition. Then following statements hold; 6045  
6046

(i) if  $\forall a \in S, |N_s(a) \cap S| < 2$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive  
SuperHyperVertex-Decomposition; 6047  
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(ii) if  $\forall a \in V \setminus S, |N_s(a) \cap S| > 2$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
SuperHyperVertex-Decomposition; 6049  
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(iii) if  $\forall a \in S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is an 2-SuperHyperDefensive  
SuperHyperVertex-Decomposition; 6051  
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(iv) if  $\forall a \in V \setminus S, |N_s(a) \cap V \setminus S| = 0$ , then  $ESHG : (V, E)$  is a dual 2-SuperHyperDefensive  
SuperHyperVertex-Decomposition. 6053  
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## Neutrosophic Applications in Cancer's Neutrosophic Recognition

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The cancer is the Neutrosophic disease but the Neutrosophic model is going to figure out what's going on this Neutrosophic phenomenon. The special Neutrosophic case of this Neutrosophic disease is considered and as the consequences of the model, some parameters are used. The cells are under attack of this disease but the moves of the cancer in the special region are the matter of mind. The Neutrosophic recognition of the cancer could help to find some Neutrosophic treatments for this Neutrosophic disease.

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In the following, some Neutrosophic steps are Neutrosophic devised on this disease.

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**Step 1. (Neutrosophic Definition)** The Neutrosophic recognition of the cancer in the long-term Neutrosophic function.

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**Step 2. (Neutrosophic Issue)** The specific region has been assigned by the Neutrosophic model [it's called Neutrosophic SuperHyperGraph] and the long Neutrosophic cycle of the move from the cancer is identified by this research. Sometimes the move of the cancer hasn't be easily identified since there are some determinacy, indeterminacy and neutrality about the moves and the effects of the cancer on that region; this event leads us to choose another model [it's said to be Neutrosophic SuperHyperGraph] to have convenient perception on what's happened and what's done.

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**Step 3. (Neutrosophic Model)** There are some specific Neutrosophic models, which are well-known and they've got the names, and some general Neutrosophic models. The moves and the Neutrosophic traces of the cancer on the complex tracks and between complicated groups of cells could be fantasized by a Neutrosophic SuperHyperPath(-/SuperHyperVertex-Decomposition, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). The aim is to find either the Neutrosophic SuperHyperVertex-Decomposition or the Neutrosophic SuperHyperVertex-Decomposition in those Neutrosophic Neutrosophic SuperHyperModels.

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Table 34.1: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges  
Belong to The Neutrosophic SuperHyperBipartite

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

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By using the Neutrosophic Figure (34.1) and the Table (34.1), the Neutrosophic SuperHyperBipartite is obtained. 6089

The obtained Neutrosophic SuperHyperSet, by the Neutrosophic Algorithm in previous 6090  
Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neut- 6091  
rosophic SuperHyperBipartite  $ESHB : (V, E)$ , in the Neutrosophic SuperHyperModel 6092  
(34.1), is the Neutrosophic SuperHyperVertex-Decomposition. 6093  
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## Case 2: The Increasing Neutrosophic Steps Toward Neutrosophic SuperHyperMultipartite as Neutrosophic SuperHyperModel

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**Step 4. (Neutrosophic Solution)** In the Neutrosophic Figure (35.1), the Neutrosophic SuperHyperMultipartite is Neutrosophic highlighted and Neutrosophic featured.

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By using the Neutrosophic Figure (35.1) and the Table (35.1), the Neutrosophic SuperHyperMultipartite is obtained.

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The obtained Neutrosophic SuperHyperSet, by the Neutrosophic Algorithm in previous

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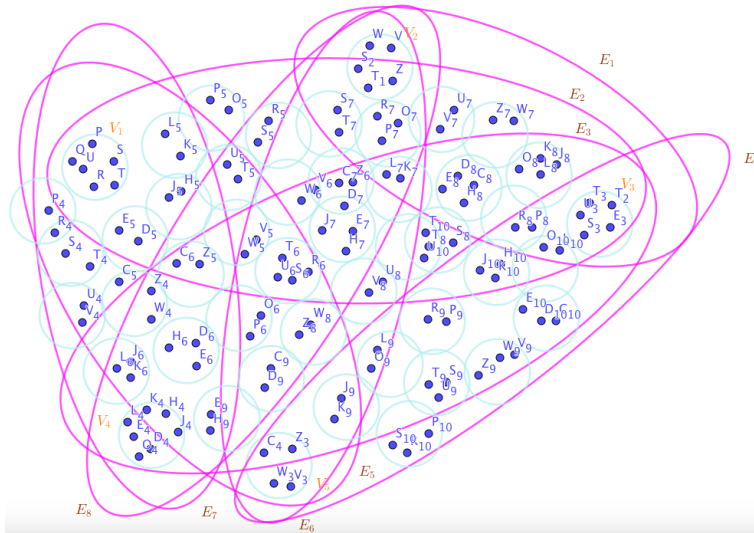


Figure 35.1: a Neutrosophic SuperHyperMultipartite Associated to the Notions of Neutrosophic SuperHyperVertex-Decomposition

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Table 35.1: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges  
 Belong to The Neutrosophic SuperHyperMultipartite

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

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result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , in the Neutrosophic SuperHyperModel (35.1), is the Neutrosophic SuperHyperVertex-Decomposition.

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## Wondering Open Problems But As The Directions To Forming The Motivations

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In what follows, some “problems” and some “questions” are proposed. 6111  
The SuperHyperVertex-Decomposition and the Neutrosophic SuperHyperVertex-Decomposition 6112  
are defined on a real-world application, titled “Cancer’s Recognitions”. 6113

**Question 36.0.1.** Which the else SuperHyperModels could be defined based on Cancer’s 6114  
recognitions? 6115

**Question 36.0.2.** Are there some SuperHyperNotions related to SuperHyperVertex- 6116  
Decomposition and the Neutrosophic SuperHyperVertex-Decomposition? 6117

**Question 36.0.3.** Are there some Algorithms to be defined on the SuperHyperModels to compute 6118  
them? 6119

**Question 36.0.4.** Which the SuperHyperNotions are related to beyond the SuperHyperVertex- 6120  
Decomposition and the Neutrosophic SuperHyperVertex-Decomposition? 6121

**Problem 36.0.5.** The SuperHyperVertex-Decomposition and the Neutrosophic SuperHyperVertex- 6122  
Decomposition do a SuperHyperModel for the Cancer’s recognitions and they’re based on 6123  
SuperHyperVertex-Decomposition, are there else? 6124

**Problem 36.0.6.** Which the fundamental SuperHyperNumbers are related to these SuperHyper- 6125  
Numbers types-results? 6126

**Problem 36.0.7.** What’s the independent research based on Cancer’s recognitions concerning 6127  
the multiple types of SuperHyperNotions? 6128



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## Conclusion and Closing Remarks

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In this section, concluding remarks and closing remarks are represented. The drawbacks of this research are illustrated. Some benefits and some advantages of this research are highlighted. This research uses some approaches to make Neutrosophic SuperHyperGraphs more understandable. In this endeavor, two SuperHyperNotions are defined on the SuperHyperVertex-Decomposition. For that sake in the second definition, the main definition of the Neutrosophic SuperHyperGraph is redefined on the position of the alphabets. Based on the new definition for the Neutrosophic SuperHyperGraph, the new SuperHyperNotion, Neutrosophic SuperHyperVertex-Decomposition, finds the convenient background to implement some results based on that. Some SuperHyperClasses and some Neutrosophic SuperHyperClasses are the cases of this research on the modeling of the regions where are under the attacks of the cancer to recognize this disease as it's mentioned on the title "Cancer's Recognitions". To formalize the instances on the SuperHyperNotion, SuperHyperVertex-Decomposition, the new SuperHyperClasses and SuperHyperClasses, are introduced. Some general results are gathered in the section on the SuperHyperVertex-Decomposition and the Neutrosophic SuperHyperVertex-Decomposition. The clarifications, instances and literature reviews have taken the whole way through. In this research, the literature reviews have fulfilled the lines containing the notions and the results. The SuperHyperGraph and Neutrosophic SuperHyperGraph are the SuperHyperModels on the "Cancer's Recognitions" and both bases are the background of this research. Sometimes the cancer has been happened on the region, full of cells, groups of cells and embedded styles. In this segment, the SuperHyperModel proposes some SuperHyperNotions based on the connectivities of the moves of the cancer in the longest and strongest styles with the formation of the design and the architecture are formally called " SuperHyperVertex-Decomposition" in the themes of jargons and buzzwords. The prefix "SuperHyper" refers to the theme of the embedded styles to figure out the background for the SuperHyperNotions. In the Table (37.1), benefits and avenues for this research are, figured out, pointed out and spoken out.

Table 37.1: An Overlook On This Research And Beyond

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Advantages	Limitations
1. Redefining Neutrosophic SuperHyperGraph	1. General Results
2. SuperHyperVertex-Decomposition	
3. Neutrosophic SuperHyperVertex-Decomposition	2. Other SuperHyperNumbers
4. Modeling of Cancer’s Recognitions	
5. SuperHyperClasses	3. SuperHyperFamilies

# Neutrosophic SuperHyperDuality But As The Extensions Excerpt From Dense And Super Forms

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**Definition 38.0.1.** (Different Neutrosophic Types of Neutrosophic SuperHyperDuality). 6160  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 6161  
Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  6162  
or  $E'$  is called 6163

- (i) **Neutrosophic e-SuperHyperDuality** if  $\forall E_i \in E', \exists E_j \in E_{NSHG:(V,E)} \setminus E'$  such that 6164  
 $V_a \in E_i, E_j$ ; 6165
- (ii) **Neutrosophic re-SuperHyperDuality** if  $\forall E_i \in E', \exists E_j \in E_{NSHG:(V,E)} \setminus E'$  such that 6166  
 $V_a \in E_i, E_j$  and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 6167
- (iii) **Neutrosophic v-SuperHyperDuality** if  $\forall V_i \in V', \exists V_j \in V_{NSHG:(V,E)} \setminus V'$  such that 6168  
 $V_i, V_j \in E_a$ ; 6169
- (iv) **Neutrosophic rv-SuperHyperDuality** if  $\forall V_i \in V', \exists V_j \in V_{NSHG:(V,E)} \setminus V'$  such that 6170  
 $V_i, V_j \in E_a$  and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 6171
- (v) **Neutrosophic SuperHyperDuality** if it's either of Neutrosophic e-SuperHyperDuality, 6172  
Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutro- 6173  
sophic rv-SuperHyperDuality. 6174

**Definition 38.0.2.** ((Neutrosophic) SuperHyperDuality). 6175  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 6176  
Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 6177

- (i) an **Extreme SuperHyperDuality** if it's either of Neutrosophic e-SuperHyperDuality, 6178  
Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutro- 6179  
sophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG :$  6180  
 $(V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high 6181  
Extreme cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme 6182  
sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they 6183  
form the Extreme SuperHyperDuality; 6184

- (ii) a **Neutrosophic SuperHyperDuality** if it's either of Neutrosophic e-SuperHyperDuality, Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutrosophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperDuality; 6185-6191
- (iii) an **Extreme SuperHyperDuality SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperDuality, Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutrosophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; and the Extreme power is corresponded to its Extreme coefficient; 6192-6200
- (iv) a **Neutrosophic SuperHyperDuality SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperDuality, Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutrosophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperDuality; and the Neutrosophic power is corresponded to its Neutrosophic coefficient; 6201-6210
- (v) an **Extreme R-SuperHyperDuality** if it's either of Neutrosophic e-SuperHyperDuality, Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutrosophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; 6211-6217
- (vi) a **Neutrosophic R-SuperHyperDuality** if it's either of Neutrosophic e-SuperHyperDuality, Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutrosophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperDuality; 6218-6224
- (vii) an **Extreme R-SuperHyperDuality SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperDuality, Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutrosophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for an 6225-6227

Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperDuality; and the Extreme power is corresponded to its Extreme coefficient;

(viii) a **Neutrosophic SuperHyperDuality SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperDuality, Neutrosophic re-SuperHyperDuality, Neutrosophic v-SuperHyperDuality, and Neutrosophic rv-SuperHyperDuality and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperDuality; and the Neutrosophic power is corresponded to its Neutrosophic coefficient.

**Example 38.0.3.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in the mentioned Neutrosophic Figures in every Neutrosophic items.

- On the Figure (30.1), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.  $E_1$  and  $E_3$  are some empty Extreme SuperHyperEdges but  $E_2$  is a loop Neutrosophic SuperHyperEdge and  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic SuperHyperDuality.

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} = \{E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} = \{V_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} = 3z.$$

- On the Figure (30.2), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.  $E_1, E_2$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in



every given Neutrosophic SuperHyperDuality.

6262

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.3), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6263

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6265

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_4, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6267

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6269

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_{3i+1_{i=0}^3}, E_{3i+24_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 6z^8. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_{3i+1_{i=0}^7}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 6z^8.\end{aligned}$$

- On the Figure (30.7), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6271

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} = \{E_{15}, E_{16}, E_{17}\}.$$

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.8), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6273 6274

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.9), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6275 6276

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_{3i+1_{i=0}^3}, E_{23}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 3z^5. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_{3i+1_{i=0}^3}, V_{15}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 3z^5.\end{aligned}$$

- On the Figure (30.10), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6277 6278

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.11), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6279 6280

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_1, E_3\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_6, V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.12), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6281 6282

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1, V_{i=4}^{i \neq 5,7,8}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 5z^5.\end{aligned}$$

- On the Figure (30.13), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6283 6284

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_5, E_9\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.14), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6285 6286

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.15), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6287 6288

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.16), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6289 6290

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= (2 \times 1 \times 2) + (2 \times 4 \times 5)z.\end{aligned}$$

- On the Figure (30.17), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6291 6292

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2)z.\end{aligned}$$

- On the Figure (30.18), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6293 6294

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= \\ (2 \times 2 \times 2)z.\end{aligned}$$

- On the Figure (30.19), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6295 6296

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_{3i+1_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 3z^4. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_{2i+1_{i=0}^5}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 2z^6.\end{aligned}$$

- On the Figure (30.20), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6297 6298

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6299 6300

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperDuality, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}
 \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} &= \{E_3, E_4\}. \\
 \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} &= 4z^2. \\
 \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} &= \{V_3, V_6\}. \\
 \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} \\
 &= 10 \times 9 + 10 \times 6 + 12 \times 9 + 12 \times 6z^2.
 \end{aligned}$$

The previous Neutrosophic approach apply on the upcoming Neutrosophic results on Neutrosophic SuperHyperClasses.

**Proposition 38.0.4.** Assume a connected Neutrosophic SuperHyperPath  $ESHP : (V, E)$ . Then

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} = \\
 &= \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} \\
 &= 3z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} \\
 &= \{V_i^{\text{EXTERNAL}}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} \\
 &= \prod |V^{\text{EXTERNAL}}_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}.
 \end{aligned}$$

*Proof.* Let

$$\begin{aligned}
 &P : \\
 &V_1^{\text{EXTERNAL}}, E_1, \\
 &V_2^{\text{EXTERNAL}}, E_2, \\
 &\dots, \\
 &E_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}, V^{\text{EXTERNAL}}_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}.
 \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperPath  $ESHP : (V, E)$ . There's a new way to redefine as

$$\begin{aligned}
 V_i^{\text{EXTERNAL}} &\sim V_j^{\text{EXTERNAL}} \equiv \\
 \exists! E_z \in E_{ESHG:(V,E)}, & V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}} \in E_z \equiv \\
 \exists! E_z \in E_{ESHG:(V,E)}, & \{V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{\text{EXTERNAL}})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{\text{EXTERNAL}}$  in the literatures of SuperHyperDuality. The latter is straightforward. ■

136EXM18a

**Example 38.0.5.** In the Figure (31.1), the connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.1), is the SuperHyperDuality. 6311  
6312  
6313

**Proposition 38.0.6.** Assume a connected Neutrosophic SuperHyperCycle  $ESH C : (V, E)$ . Then 6314

$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality}} = \\ & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperDuality SuperHyperPolynomial}} \\ & = 3z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality}} \\ & = \{V_i^{\text{EXTERNAL}}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperDuality SuperHyperPolynomial}} \\ & = \prod |V^{\text{EXTERNAL}}_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \end{aligned}$$

*Proof.* Let

6315

$$\begin{aligned} & P : \\ & V_1^{\text{EXTERNAL}}, E_1, \\ & V_2^{\text{EXTERNAL}}, E_2, \\ & \dots, \\ & E_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}^{\text{EXTERNAL}}. \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperCycle  $ESH C : (V, E)$ . 6316  
There's a new way to redefine as 6317

$$\begin{aligned} & V_i^{\text{EXTERNAL}} \sim V_j^{\text{EXTERNAL}} \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}} \in E_z \equiv \\ & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{\text{EXTERNAL}})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{\text{EXTERNAL}}$  in the literatures of SuperHyperDuality. The latter is straightforward. ■ 6318  
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136EXM19a

**Example 38.0.7.** In the Figure (31.2), the connected Neutrosophic SuperHyperCycle  $NSH C : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.2), is the Neutrosophic SuperHyperDuality. 6320  
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**Proposition 38.0.8.** Assume a connected Neutrosophic SuperHyperStar  $ESH S : (V, E)$ . Then 6323

$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperDuality}} = \{E \in E_{ESHG:(V,E)}\}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperDuality SuperHyperPolynomial}} \\ & = |i| E_i \in E_{ESHG:(V,E)} |_{\text{Neutrosophic Cardinality}} |z|. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperDuality}} = \{CENTER \in V_{ESHG:(V,E)}\}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperDuality SuperHyperPolynomial}} = z. \end{aligned}$$

*Proof.* Let

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$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

be a longest path taken a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, & V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, & \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. ■

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136EXM20a

**Example 38.0.9.** In the Figure (31.3), the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , in the Neutrosophic SuperHyperModel (31.3), is the Neutrosophic SuperHyperDuality.

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**Proposition 38.0.10.** Assume a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Then

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$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperDuality}} \\ &= \{E_i \in E_{P_i^{ESHG:(V,E)}}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ &\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperDuality SuperHyperPolynomial}} \\ &= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose} |P_i^{ESHG:(V,E)}| \right) \\ &\quad z^{\min |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\ &\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperDuality}} \\ &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, i \neq j\}. \\ &\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperDuality SuperHyperPolynomial}} \\ &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2. \end{aligned}$$

*Proof.* Let

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . 6337  
There's a new way to redefine as 6338

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded 6339  
to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. 6340  
Then there's at least one SuperHyperDuality. Thus the notion of quasi isn't up and the 6341  
SuperHyperNotions based on SuperHyperDuality could be applied. There are only two 6342  
SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the 6343  
representative in the 6344

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest SuperHyperDuality taken from a connected Neutrosophic SuperHyperBipartite 6345  
 $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of- 6346  
SuperHyperPart SuperHyperEdges are attained in any solution 6347

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

The latter is straightforward. ■ 6348

136EXM21a

**Example 38.0.11.** In the Neutrosophic Figure (31.4), the connected Neutrosophic SuperHy- 6349  
perBipartite  $ESHB : (V, E)$ , is Neutrosophic highlighted and Neutrosophic featured. The 6350  
obtained Neutrosophic SuperHyperSet, by the Neutrosophic Algorithm in previous Neutrosophic 6351  
result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyper- 6352  
Bipartite  $ESHB : (V, E)$ , in the Neutrosophic SuperHyperModel (31.4), is the Neutrosophic 6353  
SuperHyperDuality. 6354

**Proposition 38.0.12.** Assume a connected Neutrosophic SuperHyperMultipartite  $ESHM : 6355$



$(V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)^{Neutrosophic \text{ Quasi-SuperHyperDuality}} \\
 &= \{E_i \in E_{P_i^{ESHG:(V,E)}}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)^{Neutrosophic \text{ Quasi-SuperHyperDuality SuperHyperPolynomial}} \\
 &= (\sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) choose |P_i^{ESHG:(V,E)}|) \\
 & \quad z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \mathcal{C}(NSHG)^{Neutrosophic \text{ Quasi-SuperHyperDuality}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}, i \neq j\}. \\
 & \mathcal{C}(NSHG)^{Neutrosophic \text{ Quasi-SuperHyperDuality SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{Neutrosophic \text{ Cardinality}}} = (\sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| choose 2) = z^2.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest SuperHyperDuality taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. Then there's at least one SuperHyperDuality. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperDuality could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . 6366  
Thus only some SuperHyperVertices and only minimum-Neutrosophic-of-SuperHyperPart 6367  
SuperHyperEdges are attained in any solution 6368

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . 6369  
The latter is straightforward. ■ 6370

**Example 38.0.13.** In the Figure (31.5), the connected Neutrosophic SuperHyperMultipartite 6371  
 $ESHM : (V, E)$ , is highlighted and Neutrosophic featured. The obtained Neutrosophic 6372  
SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic 6373  
SuperHyperVertices of the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , 6374  
in the Neutrosophic SuperHyperModel (31.5), is the Neutrosophic SuperHyperDuality. 6375

**Proposition 38.0.14.** Assume a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . 6376  
Then, 6377

$$\begin{aligned} \mathcal{C}(NSHG)_{Neutrosophic \text{ Quasi-SuperHyperDuality}} &= \{E^* \in E_{ESHG:(V,E)}^*\}. \\ \mathcal{C}(NSHG)_{Neutrosophic \text{ Quasi-SuperHyperDuality SuperHyperPolynomial}} \\ &= |i \mid E_i^* \in E_{ESHG:(V,E)}^*|_{Neutrosophic \text{ Cardinality}}|z. \\ \mathcal{C}(NSHG)_{Neutrosophic \text{ R-Quasi-SuperHyperDuality}} &= \{CENTER \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Neutrosophic \text{ R-Quasi-SuperHyperDuality SuperHyperPolynomial}} &= z. \end{aligned}$$

*Proof.* Let 6378

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1^*, \\ V_2^{EXTERNAL}, E_2^*, \\ \dots, \\ E_{|E_{ESHG:(V,E)}^*|_{Neutrosophic \text{ Cardinality}}}, V_{|E_{ESHG:(V,E)}^*|_{Neutrosophic \text{ Cardinality}}+1}^{EXTERNAL} \end{aligned}$$

is a longest SuperHyperDuality taken from a connected Neutrosophic SuperHyperWheel 6379  
 $ESHW : (V, E)$ . There's a new way to redefine as 6380

$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} &\equiv \\ \exists! E_z^* \in E_{ESHG:(V,E)}^*, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z^* \equiv \\ \exists! E_z^* \in E_{ESHG:(V,E)}^*, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z^*. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded 6381  
to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperDuality. The latter is straightforward. 6382

Then there's at least one SuperHyperDuality. Thus the notion of quasi isn't up and the 6383  
SuperHyperNotions based on SuperHyperDuality could be applied. The unique embedded 6384  
SuperHyperDuality proposes some longest SuperHyperDuality excerpt from some representatives. 6385  
The latter is straightforward. ■ 6386

136EXM23a

**Example 38.0.15.** In the Neutrosophic Figure (31.6), the connected Neutrosophic SuperHyper- 6387  
Wheel  $NSHW : (V, E)$ , is Neutrosophic highlighted and featured. The obtained Neutrosophic 6388  
SuperHyperSet, by the Algorithm in previous result, of the Neutrosophic SuperHyperVer- 6389  
tices of the connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ , in the Neutrosophic 6390  
SuperHyperModel (31.6), is the Neutrosophic SuperHyperDuality. 6391

# Neutrosophic SuperHyperJoin But As The Extensions Excerpt From Dense And Super Forms

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**Definition 39.0.1.** (Different Neutrosophic Types of Neutrosophic SuperHyperJoin).

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Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  or  $E'$  is called

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- (i) **Neutrosophic e-SuperHyperJoin** if  $\forall E_i \in E_{NSHG:(V,E)} \setminus E', \exists E_j \in E'$ , such that  $V_a \in E_i, E_j$ ; and  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ;
- (ii) **Neutrosophic re-SuperHyperJoin** if  $\forall E_i \in E_{NSHG:(V,E)} \setminus E', \exists E_j \in E'$ , such that  $V_a \in E_i, E_j$ ;  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ; and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ;
- (iii) **Neutrosophic v-SuperHyperJoin** if  $\forall V_i \in E_{NSHG:(V,E)} \setminus V', \exists V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; and  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ;
- (iv) **Neutrosophic rv-SuperHyperJoin** if  $\forall V_i \in E_{NSHG:(V,E)} \setminus V', \exists V_j \in V'$ , such that  $V_i, V_j \in E_a$ ;  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ;
- (v) **Neutrosophic SuperHyperJoin** if it's either of Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin.

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**Definition 39.0.2.** ((Neutrosophic) SuperHyperJoin).

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Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called

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- (i) an **Extreme SuperHyperJoin** if it's either of Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme

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- cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; 6420  
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- (ii) a **Neutrosophic SuperHyperJoin** if it's either of Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperJoin; 6423  
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- (iii) an **Extreme SuperHyperJoin SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; and the Extreme power is corresponded to its Extreme coefficient; 6430  
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- (iv) a **Neutrosophic SuperHyperJoin SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperJoin; and the Neutrosophic power is corresponded to its Neutrosophic coefficient; 6439  
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- (v) an **Extreme R-SuperHyperJoin** if it's either of Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperJoin; 6448  
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- (vi) a **Neutrosophic R-SuperHyperJoin** if it's either of Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperJoin; 6455  
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(vii) an **Extreme R-SuperHyperJoin SuperHyperPolynomial** if it's either of  
Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-  
SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for an Extreme  
SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the  
Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality  
of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme  
cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices  
such that they form the Extreme SuperHyperJoin; and the Extreme power is corresponded  
to its Extreme coefficient;

(viii) a **Neutrosophic SuperHyperJoin SuperHyperPolynomial** if it's either of  
Neutrosophic e-SuperHyperJoin, Neutrosophic re-SuperHyperJoin, Neutrosophic v-  
SuperHyperJoin, and Neutrosophic rv-SuperHyperJoin and  $\mathcal{C}(NSHG)$  for a Neutrosophic  
SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains  
the Neutrosophic coefficients defined as the Neutrosophic number of the maximum  
Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic  
SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic Super-  
HyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic  
SuperHyperJoin; and the Neutrosophic power is corresponded to its Neutrosophic  
coefficient.

**Example 39.0.3.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in  
the mentioned Neutrosophic Figures in every Neutrosophic items.

- On the Figure (30.1), the Neutrosophic SuperHyperNotion, namely, Neutrosophic  
SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.  
 $E_1$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_2$  is a loop Neutrosophic  
SuperHyperEdge and  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of  
Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge,  
namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means  
that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint.  
Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic  
SuperHyperJoin.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_1, V_2, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.2), the Neutrosophic SuperHyperNotion, namely, Neutrosophic  
SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.  
 $E_1, E_2$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_4$  is a Neutrosophic  
SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only  
one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$   
is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as  
a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in

every given Neutrosophic SuperHyperJoin.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} = \{E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} = \{V_1, V_2, V_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} = z^3.$$

- On the Figure (30.3), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} = \{E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} = \{V_1, V_2, V_3\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} = z^3.$$

- On the Figure (30.4), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} = \{E_4, E_2\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} = 2z^2.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} = \{V_1, V_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} = 15z^2.$$

- On the Figure (30.5), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} = \{E_3\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} = 4z.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} = \{V_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} = z.$$

- On the Figure (30.6), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} = \{E_{3i+1_{i=0}^3}, E_{3i+24_{i=0}^3}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} 6z^8.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} = \{V_{3i+1_{i=0}^7}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} = 6z^8.$$

- On the Figure (30.7), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

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$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} = \{E_{15}, E_{16}, E_{17}\}.$$

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.8), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6510 6511

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.9), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6512 6513

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_{3i+1_{i=0}^3}, E_{23}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 3z^5. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_{3i+1_{i=0}^3}, V_{15}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= 3z^5.\end{aligned}$$

- On the Figure (30.10), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6514 6515

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_3, V_{13}, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= \\ 4 \times 5 \times 5z^3.\end{aligned}$$

- On the Figure (30.11), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6516 6517

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_1, E_3\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_6, V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$



- On the Figure (30.12), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6518 6519

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_1, V_{i=4}^{i \neq 5,7,8}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= 5z^5.\end{aligned}$$

- On the Figure (30.13), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6520 6521

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_3, E_9\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_1, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.14), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6522 6523

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.15), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6524 6525

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.16), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6526 6527

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= (1 \times 5 \times 5) + (1 \times 2 + 1)z^3.\end{aligned}$$

- On the Figure (30.17), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6528 6529

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$

- On the Figure (30.18), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6530 6531

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$

- On the Figure (30.19), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6532 6533

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_{3i+1_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 3z^4. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_{2i+1_{i=0}^5}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= 2z^6.\end{aligned}$$

- On the Figure (30.20), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6534 6535

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6536 6537

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperJoin, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \{E_2, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} &= \{V_3, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} \\ &= 10 \times 6 + 10 \times 6 + 12 \times 6 + 12 \times 6z^2.\end{aligned}$$

The previous Neutrosophic approach apply on the upcoming Neutrosophic results on Neutrosophic SuperHyperClasses.

**Proposition 39.0.4.** Assume a connected Neutrosophic SuperHyperPath  $ESHP : (V, E)$ . Then

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} &= \\ &= \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} \\ &= 3z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} \\ &= \{V_i^{\text{EXTERNAL}}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} \\ &= \prod |V^{\text{EXTERNAL}}_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}.\end{aligned}$$

*Proof.* Let

$$\begin{aligned}P : \\ V_1^{\text{EXTERNAL}}, E_1, \\ V_2^{\text{EXTERNAL}}, E_2, \\ \dots, \\ E_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}, V^{\text{EXTERNAL}}_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}.\end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperPath  $ESHP : (V, E)$ . There's a new way to redefine as

$$\begin{aligned}V_i^{\text{EXTERNAL}} &\sim V_j^{\text{EXTERNAL}} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}}\} &\subseteq E_z.\end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{\text{EXTERNAL}})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{\text{EXTERNAL}}$  in the literatures of SuperHyperJoin. The latter is straightforward. ■

136EXM18a

**Example 39.0.5.** In the Figure (31.1), the connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.1), is the SuperHyperJoin. 6548  
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**Proposition 39.0.6.** Assume a connected Neutrosophic SuperHyperCycle  $ESH C : (V, E)$ . Then 6551

$$\begin{aligned} \mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperJoin} &= \\ &= \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}. \\ \mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperJoin \ SuperHyperPolynomial} &= \\ &= 3z^{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}. \\ \mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperJoin} &= \\ &= \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}. \\ \mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperJoin \ SuperHyperPolynomial} &= \\ &= \prod |V^{EXTERNAL}_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality} z^{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}. \end{aligned}$$

*Proof.* Let

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$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}^{EXTERNAL} \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperCycle  $ESH C : (V, E)$ . 6553  
There's a new way to redefine as 6554

$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} &\equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z &\equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. ■ 6555  
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136EXM19a

**Example 39.0.7.** In the Figure (31.2), the connected Neutrosophic SuperHyperCycle  $NSH C : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.2), is the Neutrosophic SuperHyperJoin. 6557  
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**Proposition 39.0.8.** Assume a connected Neutrosophic SuperHyperStar  $ESH S : (V, E)$ . Then 6560

$$\begin{aligned} \mathcal{C}(NSHG)_{Neutrosophic \ Quasi-SuperHyperJoin} &= \{E \in E_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Neutrosophic \ Quasi-SuperHyperJoin \ SuperHyperPolynomial} &= \\ &= |i| \mid E_i \in E_{ESHG:(V,E)} |_{Neutrosophic \ Cardinality} |z|. \\ \mathcal{C}(NSHG)_{Neutrosophic \ R-Quasi-SuperHyperJoin} &= \{CENTER \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Neutrosophic \ R-Quasi-SuperHyperJoin \ SuperHyperPolynomial} &= z. \end{aligned}$$

*Proof.* Let

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$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

be a longest path taken a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} &\equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z &\equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. ■

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136EXM20a

**Example 39.0.9.** In the Figure (31.3), the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , in the Neutrosophic SuperHyperModel (31.3), is the Neutrosophic SuperHyperJoin.

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**Proposition 39.0.10.** Assume a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Then

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$$\begin{aligned} &\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperJoin}} \\ &= (PERFECT MATCHING). \\ &\{E_i \in E_{P_i^{ESHG:(V,E)}}, \\ &\quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ &\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperJoin}} \\ &= (OTHERWISE). \\ &\{\}, \\ &\text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\ &\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} \\ &= (PERFECT MATCHING). \\ &= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose } |P_i^{ESHG:(V,E)}| \right) \\ &\quad z^{\min |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\ &\text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\ &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\ &\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} \\ &= (OTHERWISE)0. \\ &\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperJoin}} \end{aligned}$$

$$\begin{aligned}
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}^{EXTERNAL}, i \neq j\}. \\
 &\mathcal{C}(NSHG)_{\text{Neutrosophic Cardinality}} \text{ Quasi-SuperHyperJoin SuperHyperPolynomial} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ .  
There's a new way to redefine as

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$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. Then there's no at least one SuperHyperJoin. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperJoin could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest SuperHyperJoin taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of SuperHyperPart SuperHyperEdges are attained in any solution

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$$\begin{aligned}
 &P : \\
 &V_1^{EXTERNAL}, E_1, \\
 &V_2^{EXTERNAL}, E_2, \\
 &\dots, \\
 &E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

The latter is straightforward.

■ 6584

**Example 39.0.11.** In the Neutrosophic Figure (31.4), the connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ , is Neutrosophic highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Neutrosophic Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ , in the Neutrosophic SuperHyperModel (31.4), is the Neutrosophic SuperHyperJoin.

**Proposition 39.0.12.** Assume a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Then

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperJoin}} \\
 &= (PERFECT MATCHING). \\
 & \{E_i \in E_{P_i^{ESHG:(V,E)}}, \\
 & \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperJoin}} \\
 &= (OTHERWISE). \\
 & \{\}, \\
 & \text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} \\
 &= (PERFECT MATCHING). \\
 &= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose } |P_i^{ESHG:(V,E)}| \right) \\
 & \quad z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} \\
 &= (OTHERWISE)0. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperJoin}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperJoin SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2.
 \end{aligned}$$

*Proof.* Let

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest SuperHyperJoin taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperJoin. The latter is straightforward. Then there's no at least one SuperHyperJoin. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperJoin could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

136EXM22a

**Example 39.0.13.** In the Figure (31.5), the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , in the Neutrosophic SuperHyperModel (31.5), is the Neutrosophic SuperHyperJoin.

**Proposition 39.0.14.** Assume a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ .



Then,

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin}} = \\
 & = \{E_i\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperJoin SuperHyperPolynomial}} \\
 & = 3z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin}} \\
 & = \{V_i^{\text{EXTERNAL}}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperJoin SuperHyperPolynomial}} \\
 & = \prod |V_i^{\text{EXTERNAL}}|_{ESHG:(V,E)}^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}} z^{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{\text{EXTERNAL}}, E_1, \\
 & V_2^{\text{EXTERNAL}}, E_2, \\
 & \dots, \\
 & E_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}, V^{\text{EXTERNAL}}_{\frac{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}}}{3}}.
 \end{aligned}$$

is a longest SuperHyperJoin taken from a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 & V_i^{\text{EXTERNAL}} \sim V_j^{\text{EXTERNAL}} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{\text{EXTERNAL}}, V_j^{\text{EXTERNAL}}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{\text{EXTERNAL}})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{\text{EXTERNAL}}$  in the literatures of SuperHyperJoin. The latter is straightforward. Then there's at least one SuperHyperJoin. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperJoin could be applied. The unique embedded SuperHyperJoin proposes some longest SuperHyperJoin excerpt from some representatives. The latter is straightforward. ■

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136EXM23a

**Example 39.0.15.** In the Neutrosophic Figure (31.6), the connected Neutrosophic SuperHyperWheel  $NSHW : (V, E)$ , is Neutrosophic highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ , in the Neutrosophic SuperHyperModel (31.6), is the Neutrosophic SuperHyperJoin.

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# Neutrosophic SuperHyperPerfect But As The Extensions Excerpt From Dense And Super Forms

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**Definition 40.0.1.** (Different Neutrosophic Types of Neutrosophic SuperHyperPerfect). 6630  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 6631  
Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  6632  
or  $E'$  is called 6633

- (i) **Neutrosophic e-SuperHyperPerfect** if  $\forall E_i \in E_{NSHG:(V,E)} \setminus E', \exists! E_j \in E'$ , such that 6634  
 $V_a \in E_i, E_j$ ; 6635
- (ii) **Neutrosophic re-SuperHyperPerfect** if  $\forall E_i \in E_{NSHG:(V,E)} \setminus E', \exists! E_j \in E'$ , such 6636  
that  $V_a \in E_i, E_j$ ; and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 6637
- (iii) **Neutrosophic v-SuperHyperPerfect** if  $\forall V_i \in V_{NSHG:(V,E)} \setminus V', \exists! V_j \in V'$ , such that 6638  
 $V_i, V_j \in E_a$ ; 6639
- (iv) **Neutrosophic rv-SuperHyperPerfect** if  $\forall V_i \in V_{NSHG:(V,E)} \setminus V', \exists! V_j \in V'$ , such that 6640  
 $V_i, V_j \in E_a$ ; and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 6641
- (v) **Neutrosophic SuperHyperPerfect** if it's either of Neutrosophic e-SuperHyperPerfect, 6642  
Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic 6643  
rv-SuperHyperPerfect. 6644

**Definition 40.0.2.** ((Neutrosophic) SuperHyperPerfect). 6645  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 6646  
Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 6647

- (i) an **Extreme SuperHyperPerfect** if it's either of Neutrosophic e-SuperHyperPerfect, 6648  
Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic 6649  
rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  6650  
is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme 6651  
cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence 6652  
of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the 6653  
Extreme SuperHyperPerfect; 6654

- (ii) a **Neutrosophic SuperHyperPerfect** if it's either of Neutrosophic e-SuperHyperPerfect, Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperPerfect; 6655-6661
- (iii) an **Extreme SuperHyperPerfect SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperPerfect, Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; and the Extreme power is corresponded to its Extreme coefficient; 6662-6670
- (iv) a **Neutrosophic SuperHyperPerfect SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperPerfect, Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperPerfect; and the Neutrosophic power is corresponded to its Neutrosophic coefficient; 6671-6680
- (v) an **Extreme R-SuperHyperPerfect** if it's either of Neutrosophic e-SuperHyperPerfect, Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; 6681-6687
- (vi) a **Neutrosophic R-SuperHyperPerfect** if it's either of Neutrosophic e-SuperHyperPerfect, Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperPerfect; 6688-6694
- (vii) an **Extreme R-SuperHyperPerfect SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperPerfect, Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains 6695-6698

the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperPerfect; and the Extreme power is corresponded to its Extreme coefficient;

- (viii) a **Neutrosophic SuperHyperPerfect SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperPerfect, Neutrosophic re-SuperHyperPerfect, Neutrosophic v-SuperHyperPerfect, and Neutrosophic rv-SuperHyperPerfect and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperPerfect; and the Neutrosophic power is corresponded to its Neutrosophic coefficient.

**Example 40.0.3.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in the mentioned Neutrosophic Figures in every Neutrosophic items.

- On the Figure (30.1), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.  $E_1$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_2$  is a loop Neutrosophic SuperHyperEdge and  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic SuperHyperPerfect.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.2), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.  $E_1, E_2$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic SuperHyperPerfect.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.3), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_4, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_{3i+1_{i=0}^3}, E_{3i+24_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 6z^8. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_{3i+1_{i=0}^7}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 6z^8.\end{aligned}$$

- On the Figure (30.7), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_{15}, E_{16}, E_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_3, V_6, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.8), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} = \{E_4\}.$$

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_3, V_6, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.9), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect}} &= \{E_{3i+1^3_{i=0}}, E_{23}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= 3z^5. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect}} &= \{V_{3i+1^3_{i=0}}, V_{15}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= 3z^5.\end{aligned}$$

- On the Figure (30.10), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_3, V_6, V_8\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 4 \times 4z^3.\end{aligned}$$

- On the Figure (30.11), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_1, E_3\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_6, V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 2z^2.\end{aligned}$$

- On the Figure (30.12), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_1, V_{i=4}^{i \neq 5,7,8}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 5z^5.\end{aligned}$$

- On the Figure (30.13), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6753 6754

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_3, E_9\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_1, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= \\ 3 \times 3z^2.\end{aligned}$$

- On the Figure (30.14), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6755 6756

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.15), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6757 6758

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.16), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6759 6760

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect}} &= \{V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= \\ (1 \times 5 \times 5) + (1 \times 2 + 1)z^3.\end{aligned}$$

- On the Figure (30.17), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6761 6762

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= \\ (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$



- On the Figure (30.18), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 3z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect}} &= \{V_{27}, V_2, V_7, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= (1 \times 1 \times 2 + 1)z^4.\end{aligned}$$

- On the Figure (30.19), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_{3i+1_{i=0}^3}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 3z^4. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect}} &= \{V_{2i+1_{i=0}^5}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= 2z^6.\end{aligned}$$

- On the Figure (30.20), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= 2z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperPerfect SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperPerfect, is up. The Neutrosophic Algorithm is Neutrosophically straightforward.

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect}} &= \{E_2, E_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect}} &= \{V_3, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperPerfect SuperHyperPolynomial}} &= 10 \times 6 + 10 \times 6 + 12 \times 6 + 12 \times 6z^2.\end{aligned}$$

The previous Neutrosophic approach apply on the upcoming Neutrosophic results on Neutrosophic SuperHyperClasses.



**Proposition 40.0.4.** Assume a connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ . Then 6775

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperPerfect} = \\
 & = \{E_i\}_{i=1}^{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperPerfect\ SuperHyperPolynomial} \\
 & = 3\mathcal{Z}^{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperPerfect} \\
 & = \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperPerfect\ SuperHyperPolynomial} \\
 & = \prod |V_i^{EXTERNAL}_{ESHG:(V,E)|_{Neutrosophic\ Cardinality}} \mathcal{Z}^{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}.
 \end{aligned}$$

*Proof.* Let

6776

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}, V_{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}^{EXTERNAL}.
 \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ . 6777  
There's a new way to redefine as 6778

$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to 6779  
 $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. ■ 6780

136EXM18a

**Example 40.0.5.** In the Figure (31.1), the connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.1), is the SuperHyperPerfect. 6781  
6782  
6783

**Proposition 40.0.6.** Assume a connected Neutrosophic SuperHyperCycle  $ESH C : (V, E)$ . Then 6784

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperPerfect} = \\
 & = \{E_i\}_{i=1}^{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperPerfect\ SuperHyperPolynomial} \\
 & = 3\mathcal{Z}^{\frac{|ESHG:(V,E)|_{Neutrosophic\ Cardinality}}{3}}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperPerfect}
 \end{aligned}$$

$$= \{V_i^{EXTERNAL}\}_{i=1}^{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperPerfect \ SuperHyperPolynomial}$$

$$= \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality} z^{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}.$$

*Proof.* Let

6785

$$P :$$

$$V_1^{EXTERNAL}, E_1,$$

$$V_2^{EXTERNAL}, E_2,$$

$$\dots,$$

$$E_{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}, V_{\frac{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}}{3}}^{EXTERNAL}.$$

be a longest path taken from a connected Neutrosophic SuperHyperCycle  $ESHG : (V, E)$ .  
There's a new way to redefine as

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$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. ■

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6789

136EXM19a

**Example 40.0.7.** In the Figure (31.2), the connected Neutrosophic SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.2), is the Neutrosophic SuperHyperPerfect.

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**Proposition 40.0.8.** Assume a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . Then

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$$\mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperPerfect} = \{E \in E_{ESHG:(V,E)}\}.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperPerfect \ SuperHyperPolynomial}$$

$$= |i \mid E_i \in E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality} |z|.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperPerfect} = \{CENTER \in V_{ESHG:(V,E)}\}.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperPerfect \ SuperHyperPolynomial} = z.$$

*Proof.* Let

6794

$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

be a longest path taken a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as

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$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. ■

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**Example 40.0.9.** In the Figure (31.3), the connected Neutrosophic SuperHyperStar  $ESH S : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperStar  $ESH S : (V, E)$ , in the Neutrosophic SuperHyperModel (31.3), is the Neutrosophic SuperHyperPerfect.

**Proposition 40.0.10.** Assume a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Then

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect}} \\
 &= (PERFECT MATCHING). \\
 & \{E_i \in E_{P_i^{ESHG:(V,E)}}, \\
 & \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect}} \\
 &= (OTHERWISE). \\
 & \{\}, \\
 & \text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (PERFECT MATCHING). \\
 &= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose } |P_i^{ESHG:(V,E)}| \right) \\
 & z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (OTHERWISE)0. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) \right) = z^2.
 \end{aligned}$$

*Proof.* Let

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . 6807  
There's a new way to redefine as 6808

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to 6809  
 $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. Then 6810  
there's no at least one SuperHyperPerfect. Thus the notion of quasi may be up but the 6811  
SuperHyperNotions based on SuperHyperPerfect could be applied. There are only two 6812  
SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the 6813  
representative in the 6814

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

is a longest SuperHyperPerfect taken from a connected Neutrosophic SuperHyperBipartite 6815  
 $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of- 6816  
SuperHyperPart SuperHyperEdges are attained in any solution 6817

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL} \end{aligned}$$

The latter is straightforward. ■ 6818

136EXM21a

**Example 40.0.11.** In the Neutrosophic Figure (31.4), the connected Neutrosophic SuperHy- 6819  
perBipartite  $ESHB : (V, E)$ , is Neutrosophic highlighted and Neutrosophic featured. The 6820  
obtained Neutrosophic SuperHyperSet, by the Neutrosophic Algorithm in previous Neutrosophic 6821  
result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyper- 6822  
Bipartite  $ESHB : (V, E)$ , in the Neutrosophic SuperHyperModel (31.4), is the Neutrosophic 6823  
SuperHyperPerfect. 6824

**Proposition 40.0.12.** Assume a connected Neutrosophic SuperHyperMultipartite  $ESHM : 6825$

$(V, E)$ . Then

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$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect}} \\
 &= (PERFECT MATCHING). \\
 & \{E_i \in E_{P_i^{ESHG:(V,E)}}, \\
 & \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect}} \\
 &= (OTHERWISE). \\
 & \{\}, \\
 & \text{If } \exists P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \neq \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (PERFECT MATCHING). \\
 &= \left( \sum_{i=|P^{ESHG:(V,E)}|} (\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|) \text{choose } |P_i^{ESHG:(V,E)}| \right) \\
 & z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperPerfect SuperHyperPolynomial}} \\
 &= (OTHERWISE)0. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect}} \\
 &= \{V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_i^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperPerfect SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{choose } 2) = z^2. \right.
 \end{aligned}$$

*Proof.* Let

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$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2, \\
 & \dots, \\
 & E_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|}, V_{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|+1}^{EXTERNAL}
 \end{aligned}$$

is a longest SuperHyperPerfect taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. Then there’s no at least one SuperHyperPerfect. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperPerfect could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|}, V_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2, \\ \dots, \\ E_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|}, V_{\min_i |P_i^{ESHG:(V,E)} \in PESHG:(V,E)|+1}^{EXTERNAL} \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

136EXM22a

**Example 40.0.13.** In the Figure (31.5), the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , in the Neutrosophic SuperHyperModel (31.5), is the Neutrosophic SuperHyperPerfect.

**Proposition 40.0.14.** Assume a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . Then,

$$\begin{aligned} \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperPerfect} &= \{E \in E_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperPerfect\ SuperHyperPolynomial} \\ &= |i \mid E_i \in E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality} |z|. \\ \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperPerfect} &= \{CENTER \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperPerfect\ SuperHyperPolynomial} &= z. \end{aligned}$$

*Proof.* Let

$$P : V_i^{EXTERNAL}, E_i, CENTER, V_j^{EXTERNAL}.$$

is a longest SuperHyperPerfect taken from a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperPerfect. The latter is straightforward. Then there's at least one SuperHyperPerfect. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperPerfect could be applied. The unique embedded SuperHyperPerfect proposes some longest SuperHyperPerfect excerpt from some representatives. The latter is straightforward. ■

136EXM23a

**Example 40.0.15.** In the Neutrosophic Figure (31.6), the connected Neutrosophic SuperHyperWheel  $NSHW : (V, E)$ , is Neutrosophic highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ , in the Neutrosophic SuperHyperModel (31.6), is the Neutrosophic SuperHyperPerfect.

# Neutrosophic SuperHyperTotal But As The Extensions Excerpt From Dense And Super Forms

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**Definition 41.0.1.** (Different Neutrosophic Types of Neutrosophic SuperHyperTotal). 6866  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 6867  
Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  6868  
or  $E'$  is called 6869

- (i) **Neutrosophic e-SuperHyperTotal** if  $\forall E_i \in E_{ESHG:(V,E)}, \exists! E_j \in E'$ , such that 6870  
 $V_a \in E_i, E_j$ ; 6871
- (ii) **Neutrosophic re-SuperHyperTotal** if  $\forall E_i \in E_{ESHG:(V,E)}, \exists! E_j \in E'$ , such that 6872  
 $V_a \in E_i, E_j$ ; and  $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 6873
- (iii) **Neutrosophic v-SuperHyperTotal** if  $\forall V_i \in V_{ESHG:(V,E)}, \exists! V_j \in V'$ , such that 6874  
 $V_i, V_j \in E_a$ ; 6875
- (iv) **Neutrosophic rv-SuperHyperTotal** if  $\forall V_i \in V_{ESHG:(V,E)}, \exists! V_j \in V'$ , such that 6876  
 $V_i, V_j \in E_a$ ; and  $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 6877
- (v) **Neutrosophic SuperHyperTotal** if it's either of Neutrosophic e-SuperHyperTotal, 6878  
Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic 6879  
rv-SuperHyperTotal. 6880

**Definition 41.0.2.** ((Neutrosophic) SuperHyperTotal). 6881  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 6882  
Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 6883

- (i) an **Extreme SuperHyperTotal** if it's either of Neutrosophic e-SuperHyperTotal, 6884  
Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic 6885  
rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  6886  
is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme 6887  
cardinality of the Extreme SuperHyperEdges in the conseNeighborive Extreme sequence 6888  
of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the 6889  
Extreme SuperHyperTotal; 6890



- (ii) a **Neutrosophic SuperHyperTotal** if it's either of Neutrosophic e-SuperHyperTotal, Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperTotal; 6891-6897
- (iii) an **Extreme SuperHyperTotal SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperTotal, Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; and the Extreme power is corresponded to its Extreme coefficient; 6898-6906
- (iv) a **Neutrosophic SuperHyperTotal SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperTotal, Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperTotal; and the Neutrosophic power is corresponded to its Neutrosophic coefficient; 6907-6916
- (v) an **Extreme R-SuperHyperTotal** if it's either of Neutrosophic e-SuperHyperTotal, Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyperVertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such that they form the Extreme SuperHyperTotal; 6917-6923
- (vi) a **Neutrosophic R-SuperHyperTotal** if it's either of Neutrosophic e-SuperHyperTotal, Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperTotal; 6924-6930
- (vii) an **Extreme R-SuperHyperTotal SuperHyperPolynomial** if it's either of Neutrosophic e-SuperHyperTotal, Neutrosophic re-SuperHyperTotal, Neutrosophic v-SuperHyperTotal, and Neutrosophic rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for an Extreme 6931-6933

SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial contains the  
Extreme coefficients defined as the Extreme number of the maximum Extreme cardinality  
of the Extreme SuperHyperVertices of an Extreme SuperHyperSet  $S$  of high Extreme  
cardinality conseNeighborive Extreme SuperHyperEdges and Extreme SuperHyperVer-  
tices such that they form the Extreme SuperHyperTotal; and the Extreme power is  
corresponded to its Extreme coefficient;

(viii) a **Neutrosophic SuperHyperTotal SuperHyperPolynomial** if it's either of  
Neutrosophic e-SuperHyperTotal, Neutrosophic re-SuperHyperTotal, Neutrosophic v-  
SuperHyperTotal, and Neutrosophic rv-SuperHyperTotal and  $\mathcal{C}(NSHG)$  for a Neutro-  
sophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic SuperHyperPolynomial  
contains the Neutrosophic coefficients defined as the Neutrosophic number of the max-  
imum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic  
SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive Neutrosophic Super-  
HyperEdges and Neutrosophic SuperHyperVertices such that they form the Neutrosophic  
SuperHyperTotal; and the Neutrosophic power is corresponded to its Neutrosophic coeffi-  
cient.

**Example 41.0.3.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in  
the mentioned Neutrosophic Figures in every Neutrosophic items.

- On the Figure (30.1), the Neutrosophic SuperHyperNotion, namely, Neutrosophic  
SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophicly straightforward.  
 $E_1$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_2$  is a loop Neutrosophic  
SuperHyperEdge and  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of  
Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge,  
namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means  
that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint.  
Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic  
SuperHyperTotal.

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal}} = \{E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal}} = \{V_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal SuperHyperPolynomial}} = 3z.$$

- On the Figure (30.2), the Neutrosophic SuperHyperNotion, namely, Neutrosophic  
SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophicly straightforward.  
 $E_1, E_2$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_4$  is a Neutrosophic  
SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only  
one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$   
is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as  
a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in

every given Neutrosophic SuperHyperTotal.

6968

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.3), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6969 6970

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6971 6972

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-}} &= \{E_4, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6973 6974

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6975 6976

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal}} &= \{E_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal SuperHyperPolynomial}} &= 20z^{10}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperTotal}} &= \{V_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperTotal SuperHyperPolynomial}} &= 20z^{10}.\end{aligned}$$

- On the Figure (30.7), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6977 6978

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_{12}, E_{13}, E_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} = z^3.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_{12}, V_{13}, V_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = z^3.$$

- On the Figure (30.8), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6979 6980

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} = \{E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_{12}, V_{13}, V_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 3 \times 4 \times 4z^3.$$

- On the Figure (30.9), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6981 6982

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal}} = \{E_{i+1}_{i=0}^9\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal SuperHyperPolynomial}} 10z^{10}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperTotal}} = \{V_{i+1}_{i=0}^9\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperTotal SuperHyperPolynomial}} = 20z^{10}.$$

- On the Figure (30.10), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6983 6984

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal}} = \{E_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperTotal SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_{12}, V_{13}, V_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 3 \times 4 \times 4z^3.$$

- On the Figure (30.11), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6985 6986

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_1, E_6, E_7, E_8\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} = 2z^4.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_1, V_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = 3z^2.$$

- On the Figure (30.12), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6987 6988

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} = \{E_1, E_2\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} = 5z^2.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} = \{V_1, V_{i=1}^{i \neq 4,5,6}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} = z^5.$$

- On the Figure (30.13), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6989

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_3, E_9, E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= 3z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= 3z^2.\end{aligned}$$

- On the Figure (30.14), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6991

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_1, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V_3\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= 2z^2.\end{aligned}$$

- On the Figure (30.15), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6993

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_2, V_3, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.16), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6995

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= 4 \times 3z^3.\end{aligned}$$

- On the Figure (30.17), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6997

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= 4 \times 3z^4.\end{aligned}$$

- On the Figure (30.18), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 6999 7000

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= \\ 2 \times 4 \times 3z^4.\end{aligned}$$

- On the Figure (30.19), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7001 7002

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal}} &= \{E_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal SuperHyperPolynomial}} &= 11z^{10}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal}} &= \{V_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 11z^{10}.\end{aligned}$$

- On the Figure (30.20), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7003 7004

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_6, E_{10}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= 9z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal}} &= \{V_1, V\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperTotal SuperHyperPolynomial}} &= (|V| - 1)z^2.\end{aligned}$$

- On the Figure (30.21), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7005 7006

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal}} &= \{E_1, E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal SuperHyperPolynomial}} &= 2z^2. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperTotal}} &= \{V_1, V_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperTotal SuperHyperPolynomial}} &= 9z^2.\end{aligned}$$

- On the Figure (30.22), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperTotal, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7007 7008

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal}} &= \{E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperTotal SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal}} &= \{V_3, V_{10}, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperTotal SuperHyperPolynomial}} &= 3 \times 6z^3.\end{aligned}$$

The previous Neutrosophic approach apply on the upcoming Neutrosophic results on Neutrosophic SuperHyperClasses. 7009 7010

**Proposition 41.0.4.** Assume a connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ . Then 7011

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal} = \\
 & = \{E_i\}_{i=1}^{|E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality}-2}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal\ SuperHyperPolynomial} \\
 & = z^{|E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality}-2}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperTotal} \\
 & = \{V_i^{EXTERNAL}\}_{i=1}^{|E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality}-2}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperTotal\ SuperHyperPolynomial} \\
 & = \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality} z^{|E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality}-2}
 \end{aligned}$$

*Proof.* Let 7012

$$\begin{aligned}
 & P : \\
 & V_2^{EXTERNAL}, E_2, \\
 & V_3^{EXTERNAL}, E_3, \\
 & \dots
 \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ . 7013  
There's a new way to redefine as 7014

$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. 7015 7016

136EXM18a

**Example 41.0.5.** In the Figure (31.1), the connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.1), is the SuperHyperTotal. 7017 7018 7019

**Proposition 41.0.6.** Assume a connected Neutrosophic SuperHyperCycle  $ESH C : (V, E)$ . Then 7020

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal} = \\
 & = \{E_i\}_{i=1}^{|E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality}-2}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal\ SuperHyperPolynomial} \\
 & = (|E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality} - 1) \\
 & z^{|E_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality}-2}. \\
 & \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperTotal}
 \end{aligned}$$



$$= \{V_i^{EXTERNAL}\}_{i=1}^{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-2}.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperTotal \ SuperHyperPolynomial}$$

$$= \prod |V^{EXTERNAL}_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality} z^{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-2}$$

*Proof.* Let

7021

$$P :$$

$$V_2^{EXTERNAL}, E_2,$$

$$V_3^{EXTERNAL}, E_3,$$

$$\dots,$$

$$\frac{E_{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-1}}{,} V^{EXTERNAL}_{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-1}.$$

be a longest path taken from a connected Neutrosophic SuperHyperCycle  $ESHG : (V, E)$ . 7022  
There's a new way to redefine as 7023

$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. ■ 7025

136EXM19a

**Example 41.0.7.** In the Figure (31.2), the connected Neutrosophic SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.2), is the Neutrosophic SuperHyperTotal. 7026  
7027  
7028

**Proposition 41.0.8.** Assume a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . Then 7029

$$\mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperTotal} = \{E_i, E_j \in E_{ESHG:(V,E)}\}.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperTotal \ SuperHyperPolynomial}$$

$$= |i(i-1)| \mid E_i \in E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}| z^2.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperTotal} = \{CENTER, V_j \in V_{ESHG:(V,E)}\}.$$

$$\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperTotal \ SuperHyperPolynomial} =$$

$$(|V_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}) \text{ choose } (|V_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality} - 1)$$

$$z^2.$$

*Proof.* Let

7030

$$P : V_i^{EXTERNAL}, E_i, CENTER, E_j.$$

be a longest path taken a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as 7031  
7032

$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv$$

$$\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$



The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. ■

136EXM20a

**Example 41.0.9.** In the Figure (31.3), the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , in the Neutrosophic SuperHyperModel (31.3), is the Neutrosophic SuperHyperTotal.

**Proposition 41.0.10.** Assume a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Then

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal}} \\
 &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\
 & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal}} \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal SuperHyperPolynomial}} \\
 &= z^{\min |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperTotal}} \\
 &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_b^{EXTERNAL} \in V_{P_j^{ESHG:(V,E)}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperTotal SuperHyperPolynomial}} \\
 &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{ choose } 2) \right) = z^2.
 \end{aligned}$$

*Proof.* Let

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2
 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . There’s a new way to redefine as

$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. Then there’s no at least one SuperHyperTotal. Thus the notion of quasi may be up but the SuperHyperNotions

based on SuperHyperTotal could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest SuperHyperTotal taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

The latter is straightforward. ■

136EXM21a

**Example 41.0.11.** In the Neutrosophic Figure (31.4), the connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ , is Neutrosophic highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Neutrosophic Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ , in the Neutrosophic SuperHyperModel (31.4), is the Neutrosophic SuperHyperTotal.

**Proposition 41.0.12.** Assume a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Then

$$\begin{aligned} & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal} \\ &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\ & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal} \\ & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal\ SuperHyperPolynomial} \\ &= z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\ & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\ &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal} \\ &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_b^{EXTERNAL} \in V_{P_j^{ESHG:(V,E)}}, i \neq j\}. \\ & \mathcal{C}(NSHG)_{Neutrosophic\ Quasi-SuperHyperTotal\ SuperHyperPolynomial} \\ &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{Neutrosophic\ Cardinality}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{ choose } 2) \right) = z^2. \end{aligned}$$

*Proof.* Let

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$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest SuperHyperTotal taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

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$$V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. Then there's no at least one SuperHyperTotal. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperTotal could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

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$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of-SuperHyperPart SuperHyperEdges are attained in any solution

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$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

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136EXM22a

**Example 41.0.13.** In the Figure (31.5), the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , in the Neutrosophic SuperHyperModel (31.5), is the Neutrosophic SuperHyperTotal.

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**Proposition 41.0.14.** Assume a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . Then,

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$$\mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal} = \{E_i, E_j \in E_{ESHG:(V,E)}^*\}. \\ \mathcal{C}(NSHG)_{Neutrosophic\ SuperHyperTotal\ SuperHyperPolynomial} \\ = |i(i-1) \mid E_i \in E_{ESHG:(V,E)}^*|_{Neutrosophic\ Cardinality} z^2.$$

$$\begin{aligned} \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperTotal} &= \{CENTER, V_j \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Neutrosophic\ R-SuperHyperTotal\ SuperHyperPolynomial} &= \\ (|V_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality}) \text{ choose } &(|V_{ESHG:(V,E)}|_{Neutrosophic\ Cardinality} - 1) \\ z^2. \end{aligned}$$

*Proof.* Let

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$$P : V_i^{EXTERNAL}, E_i^*, CENTER, E_j.$$

is a longest SuperHyperTotal taken from a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . There's a new way to redefine as

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$$\begin{aligned} V_i^{EXTERNAL} \sim V_j^{EXTERNAL} &\equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperTotal. The latter is straightforward. Then there's at least one SuperHyperTotal. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperTotal could be applied. The unique embedded SuperHyperTotal proposes some longest SuperHyperTotal excerpt from some representatives. The latter is straightforward. ■

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136EXM23a

**Example 41.0.15.** In the Neutrosophic Figure (31.6), the connected Neutrosophic SuperHyperWheel  $NSHW : (V, E)$ , is Neutrosophic highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ , in the Neutrosophic SuperHyperModel (31.6), is the Neutrosophic SuperHyperTotal.

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# Neutrosophic SuperHyperConnected But As The Extensions Excerpt From Dense And Super Forms

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**Definition 42.0.1.** (Different Neutrosophic Types of Neutrosophic SuperHyperConnected). 7100  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 7101  
Neutrosophic SuperHyperSet  $V' = \{V_1, V_2, \dots, V_s\}$  and  $E' = \{E_1, E_2, \dots, E_z\}$ . Then either  $V'$  7102  
or  $E'$  is called 7103

- (i) **Neutrosophic e-SuperHyperConnected** if  $\forall E_i \in E_{NSHG:(V,E)} \setminus E', \exists E_j \in E'$ , such 7104  
that  $V_a \in E_i, E_j$ ; and  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ; 7105
- (ii) **Neutrosophic re-SuperHyperConnected** if  $\forall E_i \in E_{NSHG:(V,E)} \setminus E', \exists E_j \in$  7106  
 $E'$ , such that  $V_a \in E_i, E_j$ ;  $\forall E_i, E_j \in E'$ , such that  $V_a \notin E_i, E_j$ ; and 7107  
 $|E_i|_{\text{NEUTROSOPIC CARDINALITY}} = |E_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 7108
- (iii) **Neutrosophic v-SuperHyperConnected** if  $\forall V_i \in E_{NSHG:(V,E)} \setminus V', \exists V_j \in V'$ , such 7109  
that  $V_i, V_j \notin E_a$ ; and  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; 7110
- (iv) **Neutrosophic rv-SuperHyperConnected** if  $\forall V_i \in E_{NSHG:(V,E)} \setminus V', \exists V_j \in$  7111  
 $V'$ , such that  $V_i, V_j \in E_a$ ;  $\forall V_i, V_j \in V'$ , such that  $V_i, V_j \notin E_a$ ; and 7112  
 $|V_i|_{\text{NEUTROSOPIC CARDINALITY}} = |V_j|_{\text{NEUTROSOPIC CARDINALITY}}$ ; 7113
- (v) **Neutrosophic SuperHyperConnected** if it's either of Neutrosophic e-SuperHyperConnected, 7114  
Neutrosophic re-SuperHyperConnected, Neutrosophic v-SuperHyperConnected, and Neut- 7115  
rosophic rv-SuperHyperConnected. 7116

**Definition 42.0.2.** ((Neutrosophic) SuperHyperConnected). 7117  
Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$ . Consider a 7118  
Neutrosophic SuperHyperEdge (NSHE)  $E = \{V_1, V_2, \dots, V_s\}$ . Then  $E$  is called 7119

- (i) an **Extreme SuperHyperConnected** if it's either of Neutrosophic e-SuperHyperConnected, 7120  
Neutrosophic re-SuperHyperConnected, Neutrosophic v-SuperHyperConnected, and Neut- 7121  
rosophic rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph 7122  
 $NSHG : (V, E)$  is the maximum Extreme cardinality of an Extreme SuperHyperSet  $S$  7123

- of high Extreme cardinality of the Extreme SuperHyperEdges in the conseNeighborive  
Extreme sequence of Extreme SuperHyperEdges and Extreme SuperHyperVertices such  
that they form the Extreme SuperHyperConnected;
- (ii) a **Neutrosophic SuperHyperConnected** if it's either of Neutrosophic e-  
SuperHyperConnected, Neutrosophic re-SuperHyperConnected, Neutrosophic v-  
SuperHyperConnected, and Neutrosophic rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$   
for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic  
cardinality of the Neutrosophic SuperHyperEdges of a Neutrosophic SuperHyperSet  $S$   
of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and  
Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperCon-  
nected;
- (iii) an **Extreme SuperHyperConnected SuperHyperPolynomial** if it's either of Neut-  
rosophic e-SuperHyperConnected, Neutrosophic re-SuperHyperConnected, Neutrosophic  
v-SuperHyperConnected, and Neutrosophic rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$  for  
an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme SuperHyperPolynomial  
contains the Extreme coefficients defined as the Extreme number of the maximum Ex-  
treme cardinality of the Extreme SuperHyperEdges of an Extreme SuperHyperSet  $S$   
of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and Extreme  
SuperHyperVertices such that they form the Extreme SuperHyperConnected; and the  
Extreme power is corresponded to its Extreme coefficient;
- (iv) a **Neutrosophic SuperHyperConnected SuperHyperPolynomial** if it's either of  
Neutrosophic e-SuperHyperConnected, Neutrosophic re-SuperHyperConnected, Neut-  
rosophic v-SuperHyperConnected, and Neutrosophic rv-SuperHyperConnected and  
 $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic  
SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic  
number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperEdges  
of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive  
Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form  
the Neutrosophic SuperHyperConnected; and the Neutrosophic power is corresponded to  
its Neutrosophic coefficient;
- (v) an **Extreme R-SuperHyperConnected** if it's either of Neutrosophic e-  
SuperHyperConnected, Neutrosophic re-SuperHyperConnected, Neutrosophic v-  
SuperHyperConnected, and Neutrosophic rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$   
for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the maximum Extreme cardinality  
of an Extreme SuperHyperSet  $S$  of high Extreme cardinality of the Extreme SuperHyper-  
Vertices in the conseNeighborive Extreme sequence of Extreme SuperHyperEdges and  
Extreme SuperHyperVertices such that they form the Extreme SuperHyperConnected;
- (vi) a **Neutrosophic R-SuperHyperConnected** if it's either of Neutrosophic e-  
SuperHyperConnected, Neutrosophic re-SuperHyperConnected, Neutrosophic v-  
SuperHyperConnected, and Neutrosophic rv-SuperHyperConnected and  $\mathcal{C}(NSHG)$   
for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the maximum Neutrosophic  
cardinality of the Neutrosophic SuperHyperVertices of a Neutrosophic SuperHyperSet  $S$   
of high Neutrosophic cardinality conseNeighborive Neutrosophic SuperHyperEdges and

Neutrosophic SuperHyperVertices such that they form the Neutrosophic SuperHyperCon- 7167  
nected; 7168

(vii) an **Extreme R-SuperHyperConnected SuperHyperPolynomial** if it's either of 7169  
Neutrosophic e-SuperHyperConnected, Neutrosophic re-SuperHyperConnected, Neut- 7170  
rosophic v-SuperHyperConnected, and Neutrosophic rv-SuperHyperConnected and 7171  
 $\mathcal{C}(NSHG)$  for an Extreme SuperHyperGraph  $NSHG : (V, E)$  is the Extreme Super- 7172  
HyperPolynomial contains the Extreme coefficients defined as the Extreme number of the 7173  
maximum Extreme cardinality of the Extreme SuperHyperVertices of an Extreme Super- 7174  
HyperSet  $S$  of high Extreme cardinality conseNeighborive Extreme SuperHyperEdges and 7175  
Extreme SuperHyperVertices such that they form the Extreme SuperHyperConnected; 7176  
and the Extreme power is corresponded to its Extreme coefficient; 7177

(viii) a **Neutrosophic SuperHyperConnected SuperHyperPolynomial** if it's either of 7178  
Neutrosophic e-SuperHyperConnected, Neutrosophic re-SuperHyperConnected, Neut- 7179  
rosophic v-SuperHyperConnected, and Neutrosophic rv-SuperHyperConnected and 7180  
 $\mathcal{C}(NSHG)$  for a Neutrosophic SuperHyperGraph  $NSHG : (V, E)$  is the Neutrosophic 7181  
SuperHyperPolynomial contains the Neutrosophic coefficients defined as the Neutrosophic 7182  
number of the maximum Neutrosophic cardinality of the Neutrosophic SuperHyperVertices 7183  
of a Neutrosophic SuperHyperSet  $S$  of high Neutrosophic cardinality conseNeighborive 7184  
Neutrosophic SuperHyperEdges and Neutrosophic SuperHyperVertices such that they form 7185  
the Neutrosophic SuperHyperConnected; and the Neutrosophic power is corresponded to 7186  
its Neutrosophic coefficient. 7187

**Example 42.0.3.** Assume a Neutrosophic SuperHyperGraph (NSHG)  $S$  is a pair  $S = (V, E)$  in 7188  
the mentioned Neutrosophic Figures in every Neutrosophic items. 7189

- On the Figure (30.1), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super- 7190  
HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophicly straightforward. 7191  
 $E_1$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_2$  is a loop Neutrosophic 7192  
SuperHyperEdge and  $E_4$  is a Neutrosophic SuperHyperEdge. Thus in the terms of Neutro- 7193  
sophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely,  $E_4$ . 7194  
The Neutrosophic SuperHyperVertex,  $V_3$  is Neutrosophic isolated means that there's no 7195  
Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint. Thus the Neutrosophic 7196  
SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic SuperHyperConnected. 7197

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected}} = \{E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected}} = \{V_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected SuperHyperPolynomial}} = 3z.$$

- On the Figure (30.2), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super- 7198  
HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophicly straightforward. 7199  
 $E_1, E_2$  and  $E_3$  are some empty Neutrosophic SuperHyperEdges but  $E_4$  is a Neutrosophic 7200  
SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only 7201  
one Neutrosophic SuperHyperEdge, namely,  $E_4$ . The Neutrosophic SuperHyperVertex,  $V_3$  7202  
is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as 7203



a Neutrosophic endpoint. Thus the Neutrosophic SuperHyperVertex,  $V_3$ , is excluded in every given Neutrosophic SuperHyperConnected. 7204 7205

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.3), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7206 7207

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected}} &= \{E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected}} &= \{V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected SuperHyperPolynomial}} &= 3z.\end{aligned}$$

- On the Figure (30.4), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7208 7209

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected}} &= \{E_1, E_2, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected}} &= \{V_1, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 15z^2.\end{aligned}$$

- On the Figure (30.5), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7210 7211

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected}} &= \{E_3\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected SuperHyperPolynomial}} &= 4z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected}} &= \{V_5\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.6), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7212 7213

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected}} &= \{E_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 20z^{10}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected}} &= \{V_{i+1}_{i=0}^9\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 20z^{10}.\end{aligned}$$

- On the Figure (30.7), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7214 7215

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} = \{E_{12}, E_{13}, E_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} = z^3.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} = \{V_{12}, V_{13}, V_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} = z^3.$$

- On the Figure (30.8), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7216 7217

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} = \{E_4\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} = \{V_{12}, V_{13}, V_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} = 3 \times 4 \times 4z^3.$$

- On the Figure (30.9), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7218 7219

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected}} = \{E_{i+1}_{i=0}^9\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected SuperHyperPolynomial}} 10z^{10}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected}} = \{V_{i+1}_{i=11}^{19}, V_{22}\}.$$

$$\mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected SuperHyperPolynomial}} = 20z^{10}.$$

- On the Figure (30.10), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7220 7221

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} = \{E_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} = z.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} = \{V_{12}, V_{13}, V_{14}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} = 3 \times 4 \times 4z^3.$$

- On the Figure (30.11), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7222 7223

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} = \{E_1, E_6, E_7, E_8\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} = 2z^4.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} = \{V_1, V_5\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} = 3z^2.$$

- On the Figure (30.12), the Neutrosophic SuperHyperNotion, namely, Neutrosophic SuperHyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7224 7225

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} = \{E_1, E_2\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} = 5z^2.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} = \{V_1, V_{i=1}^{i \neq 4,5,6}\}.$$

$$\mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} = z^5.$$

- On the Figure (30.13), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super- 7226  
 HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7227

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_3, E_9, E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 3z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_1, V_5\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= 3z^2.\end{aligned}$$

- On the Figure (30.14), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super- 7228  
 HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7229

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.15), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super- 7230  
 HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7231

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_2, V_3, V_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z^3.\end{aligned}$$

- On the Figure (30.16), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super- 7232  
 HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7233

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= \\ 4 \times 3z^3.\end{aligned}$$

- On the Figure (30.17), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super- 7234  
 HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7235

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_1, V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= \\ 4 \times 3z^4.\end{aligned}$$

- On the Figure (30.18), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super-HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7236 7237

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_2, E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z^3. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_1, V_2, V_6, V_{17}\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 2 \times 4 \times 3z^4.\end{aligned}$$

- On the Figure (30.19), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super-HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7238 7239

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected}} &= \{E_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 11z^{10}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected}} &= \{V_{i+2_{i=011}}\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 11z^{10}.\end{aligned}$$

- On the Figure (30.20), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super-HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7240 7241

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected}} &= \{E_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme SuperHyperConnected SuperHyperPolynomial}} &= 10z. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-SuperHyperConnected SuperHyperPolynomial}} &= z.\end{aligned}$$

- On the Figure (30.21), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super-HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7242 7243

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected}} &= \{E_2\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic SuperHyperConnected SuperHyperPolynomial}} &= z. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected}} &= \{V_1\}. \\ \mathcal{C}(NSHG)_{\text{Neutrosophic R-SuperHyperConnected SuperHyperPolynomial}} &= 10z.\end{aligned}$$

- On the Figure (30.22), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Super-HyperConnected, is up. The Neutrosophic Algorithm is Neutrosophically straightforward. 7244 7245

$$\begin{aligned}\mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected}} &= \{E_3, E_4\}. \\ \mathcal{C}(NSHG)_{\text{Extreme Quasi-SuperHyperConnected SuperHyperPolynomial}} &= z^2. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected}} &= \{V_3, V_{10}, V_6\}. \\ \mathcal{C}(NSHG)_{\text{Extreme R-Quasi-SuperHyperConnected SuperHyperPolynomial}} &= 3 \times 6z^3.\end{aligned}$$

The previous Neutrosophic approach apply on the upcoming Neutrosophic results on Neutrosophic SuperHyperClasses. 7246 7247

**Proposition 42.0.4.** Assume a connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ . Then 7248

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected}} = \\
 & = \{E_i\}_{i=1}^{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected SuperHyperPolynomial}} \\
 & = z^{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected}} \\
 & = \{V_i^{EXTERNAL}\}_{i=1}^{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected SuperHyperPolynomial}} \\
 & = \prod |V^{EXTERNAL}_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} z^{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 2}
 \end{aligned}$$

*Proof.* Let

7249

$$\begin{aligned}
 & P : \\
 & V_2^{EXTERNAL}, E_2, \\
 & V_3^{EXTERNAL}, E_3, \\
 & \dots, \\
 & E_{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 1}, V^{EXTERNAL}_{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 1}.
 \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ . 7250  
There's a new way to redefine as 7251

$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to 7252  
 $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. ■ 7253

136EXM18a

**Example 42.0.5.** In the Figure (31.1), the connected Neutrosophic SuperHyperPath  $ESH P : (V, E)$ , is highlighted and featured. The Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.1), is the SuperHyperConnected. 7254  
7255  
7256

**Proposition 42.0.6.** Assume a connected Neutrosophic SuperHyperCycle  $ESH C : (V, E)$ . Then 7257

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected}} = \\
 & = \{E_i\}_{i=1}^{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected SuperHyperPolynomial}} \\
 & = (|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 1) \\
 & z^{|E_{ESHG:(V,E)}|_{\text{Neutrosophic Cardinality}} - 2}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic R-Quasi-SuperHyperConnected}}
 \end{aligned}$$

$$\begin{aligned}
 &= \{V_i^{EXTERNAL}\}_{i=1}^{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-2}. \\
 &\mathcal{C}(NSHG)_{Neutrosophic \ R-Quasi-SuperHyperConnected \ SuperHyperPolynomial} \\
 &= \prod |V_i^{EXTERNAL}_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality} z^{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-2}
 \end{aligned}$$

*Proof.* Let

7258

$$\begin{aligned}
 &P : \\
 &V_2^{EXTERNAL}, E_2, \\
 &V_3^{EXTERNAL}, E_3, \\
 &\dots, \\
 &E_{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-1}, V_{|E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality}-1}^{EXTERNAL}.
 \end{aligned}$$

be a longest path taken from a connected Neutrosophic SuperHyperCycle  $ESHG : (V, E)$ . 7259

There's a new way to redefine as

7260

$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. ■ 7261 7262

136EXM19a

**Example 42.0.7.** In the Figure (31.2), the connected Neutrosophic SuperHyperCycle  $NSHC : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (31.2), is the Neutrosophic SuperHyperConnected. 7263 7264 7265

**Proposition 42.0.8.** Assume a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . Then 7266

$$\begin{aligned}
 &\mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperConnected} = \{E_i \in E_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperConnected \ SuperHyperPolynomial} \\
 &= |i| \mid E_i \in |E_{ESHG:(V,E)}|_{Neutrosophic \ Cardinality} z. \\
 &\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperConnected} = \{CENTER \in V_{ESHG:(V,E)}\}. \\
 &\mathcal{C}(NSHG)_{Neutrosophic \ R-SuperHyperConnected \ SuperHyperPolynomial} = z.
 \end{aligned}$$

*Proof.* Let

7267

$$P : V_i^{EXTERNAL}, E_i, CENTER, E_j.$$

be a longest path taken a connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ . There's a new way to redefine as 7268 7269

$$\begin{aligned}
 &V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 &\exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. ■ 7270 7271

**Example 42.0.9.** In the Figure (31.3), the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , is highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperStar  $ESHS : (V, E)$ , in the Neutrosophic SuperHyperModel (31.3), is the Neutrosophic SuperHyperConnected.

**Proposition 42.0.10.** Assume a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Then

$$\begin{aligned}
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected}} \\
 &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\
 & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected SuperHyperPolynomial}} \\
 &= z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\
 & \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\
 &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic V-SuperHyperConnected}} \\
 &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}^{EXTERNAL}}, V_b^{EXTERNAL} \in V_{P_j^{ESHG:(V,E)}^{EXTERNAL}}, i \neq j\}. \\
 & \mathcal{C}(NSHG)_{\text{Neutrosophic V-SuperHyperConnected SuperHyperPolynomial}} \\
 &= \sum_{\substack{|V_{ESHG:(V,E)}^{EXTERNAL}| \\ \text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{ choose } 2) \right) = z^2.
 \end{aligned}$$

*Proof.* Let

$$\begin{aligned}
 & P : \\
 & V_1^{EXTERNAL}, E_1, \\
 & V_2^{EXTERNAL}, E_2
 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . There's a new way to redefine as

$$\begin{aligned}
 & V_i^{EXTERNAL} \sim V_j^{EXTERNAL} \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\
 & \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z.
 \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. Then there's no at least one SuperHyperConnected. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperConnected could be applied. There are only two SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$P :$$

$$V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

is a longest SuperHyperConnected taken from a connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of SuperHyperPart SuperHyperEdges are attained in any solution

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$

The latter is straightforward. ■ 7291

**Example 42.0.11.** In the Neutrosophic Figure (31.4), the connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ , is Neutrosophic highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Neutrosophic Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperBipartite  $ESHB : (V, E)$ , in the Neutrosophic SuperHyperModel (31.4), is the Neutrosophic SuperHyperConnected. 7292  
7293  
7294  
7295  
7296  
7297

**Proposition 42.0.12.** Assume a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Then 7298  
7299

$$\begin{aligned} & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected}} \\ &= \{E_a \in E_{P_i^{ESHG:(V,E)}}, \\ & \quad \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| = \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic Quasi-SuperHyperConnected SuperHyperPolynomial}} \\ &= z^{\min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|} \\ & \quad \text{where } \forall P_i^{ESHG:(V,E)}, |P_i^{ESHG:(V,E)}| \\ &= \min_i |P_i^{ESHG:(V,E)} \in P^{ESHG:(V,E)}|\}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic V-SuperHyperConnected}} \\ &= \{V_a^{EXTERNAL} \in V_{P_i^{ESHG:(V,E)}}, V_b^{EXTERNAL} \in V_{P_j^{ESHG:(V,E)}}, i \neq j\}. \\ & \mathcal{C}(NSHG)_{\text{Neutrosophic V-SuperHyperConnected SuperHyperPolynomial}} \\ &= \sum_{|V_{ESHG:(V,E)}^{EXTERNAL}|_{\text{Neutrosophic Cardinality}}} = \left( \sum_{i=|P^{ESHG:(V,E)}|} (|P_i^{ESHG:(V,E)}| \text{ choose } 2) \right) = z^2. \end{aligned}$$

*Proof.* Let 7300

$$P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2$$



is a longest SuperHyperConnected taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, & V_i^{EXTERNAL}, V_j^{EXTERNAL} \in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, & \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} \subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. Then there's no at least one SuperHyperConnected. Thus the notion of quasi may be up but the SuperHyperNotions based on SuperHyperConnected could be applied. There are only  $z'$  SuperHyperParts. Thus every SuperHyperPart could have one SuperHyperVertex as the representative in the

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . Thus only some SuperHyperVertices and only minimum-Neutrosophic-of-SuperHyperPart SuperHyperEdges are attained in any solution

$$\begin{aligned} P : \\ V_1^{EXTERNAL}, E_1, \\ V_2^{EXTERNAL}, E_2 \end{aligned}$$

is a longest path taken from a connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ . The latter is straightforward. ■

136EXM22a

**Example 42.0.13.** In the Figure (31.5), the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , is highlighted and Neutrosophic featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous Neutrosophic result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperMultipartite  $ESHM : (V, E)$ , in the Neutrosophic SuperHyperModel (31.5), is the Neutrosophic SuperHyperConnected.

**Proposition 42.0.14.** Assume a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . Then,

$$\begin{aligned} \mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperConnected} &= \{E_i \in E_{ESHG:(V,E)}^*\}. \\ \mathcal{C}(NSHG)_{Neutrosophic \ SuperHyperConnected \ SuperHyperPolynomial} \\ &= |i \mid E_i \in |E_{ESHG:(V,E)}^*|_{Neutrosophic \ Cardinality}|z. \\ \mathcal{C}(NSHG)_{Neutrosophic \ V-SuperHyperConnected} &= \{CENTER \in V_{ESHG:(V,E)}\}. \\ \mathcal{C}(NSHG)_{Neutrosophic \ V-SuperHyperConnected \ SuperHyperPolynomial} &= z. \end{aligned}$$

*Proof.* Let

$$P : V_i^{EXTERNAL}, E_i^*, CENTER, E_j.$$

is a longest SuperHyperConnected taken from a connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ . There's a new way to redefine as

$$\begin{aligned} V_i^{EXTERNAL} &\sim V_j^{EXTERNAL} \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, V_i^{EXTERNAL}, V_j^{EXTERNAL} &\in E_z \equiv \\ \exists! E_z \in E_{ESHG:(V,E)}, \{V_i^{EXTERNAL}, V_j^{EXTERNAL}\} &\subseteq E_z. \end{aligned}$$

The term “EXTERNAL” implies  $|N(V_i^{EXTERNAL})| \geq |N(V_j)|$  where  $V_j$  is corresponded to  $V_i^{EXTERNAL}$  in the literatures of SuperHyperConnected. The latter is straightforward. Then there's at least one SuperHyperConnected. Thus the notion of quasi isn't up and the SuperHyperNotions based on SuperHyperConnected could be applied. The unique embedded SuperHyperConnected proposes some longest SuperHyperConnected excerpt from some representatives. The latter is straightforward. ■

136EXM23a

**Example 42.0.15.** In the Neutrosophic Figure (31.6), the connected Neutrosophic SuperHyperWheel  $NSHW : (V, E)$ , is Neutrosophic highlighted and featured. The obtained Neutrosophic SuperHyperSet, by the Algorithm in previous result, of the Neutrosophic SuperHyperVertices of the connected Neutrosophic SuperHyperWheel  $ESHW : (V, E)$ , in the Neutrosophic SuperHyperModel (31.6), is the Neutrosophic SuperHyperConnected.



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## Background

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There are some scientific researches covering the topic of this research. In what follows, there are some discussion and literature reviews about them.

The seminal paper and groundbreaking article is titled “neutrosophic co-degree and neutrosophic degree alongside chromatic numbers in the setting of some classes related to neutrosophic hypergraphs” in **Ref. [HG1]** by Henry Garrett (2022). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on general forms without using neutrosophic classes of neutrosophic SuperHyperGraph. It’s published in prestigious and fancy journal is entitled “Journal of Current Trends in Computer Science Research (JCTCSR)” with ISO abbreviation “J Curr Trends Comp Sci Res” in volume 1 and issue 1 with pages 06-14. The research article studies deeply with choosing neutrosophic hypergraphs instead of neutrosophic SuperHyperGraph. It’s the breakthrough toward independent results based on initial background.

The seminal paper and groundbreaking article is titled “Super Hyper Dominating and Super Hyper Resolving on Neutrosophic Super Hyper Graphs and Their Directions in Game Theory and Neutrosophic Super Hyper Classes” in **Ref. [HG2]** by Henry Garrett (2022). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on fundamental SuperHyperNumber and using neutrosophic SuperHyperClasses of neutrosophic SuperHyperGraph. It’s published in prestigious and fancy journal is entitled “Journal of Mathematical Techniques and Computational Mathematics(JMTCM)” with ISO abbreviation “J Math Techniques Comput Math” in volume 1 and issue 3 with pages 242-263. The research article studies deeply with choosing directly neutrosophic SuperHyperGraph and SuperHyperGraph. It’s the breakthrough toward independent results based on initial background and fundamental SuperHyperNumbers.

The seminal paper and groundbreaking article is titled “Some Super Hyper Degrees and Co-Super Hyper Degrees on Neutrosophic Super Hyper Graphs And Super Hyper Graphs Alongside Applications in Cancer’s Treatments” in **Ref. [HG3]** by Henry Garrett (2023). In this research article, a novel approach is implemented on SuperHyperGraph and neutrosophic SuperHyperGraph based on fundamental notions and using vital tools in Cancer’s Treatments. It’s published in prestigious and fancy journal is entitled “Journal of Mathematical Techniques and Computational Mathematics(JMTCM)” with ISO abbreviation “J Math Techniques Comput Math” in volume 2 and issue 1 with pages 35-47. The research article studies deeply with choosing directly neutrosophic SuperHyperGraph and SuperHyperGraph. It’s the breakthrough toward independent results based on initial background and fundamental SuperHyperNumbers.

In some articles are titled “0039 | Closing Numbers and Super-Closing Numbers as  
(Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-  
SuperHyperGraph” in **Ref. [HG4]** by Henry Garrett (2022), “0049 | (Failed)1-Zero-Forcing  
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**HG186; HG187; HG188; HG189; HG190; HG191; HG192; HG193; HG194; HG195; HG196; HG197; HG198; HG199; HG200; HG201**], there are some endeavors to formalize the basic SuperHyperNotions about neutrosophic SuperHyperGraph and SuperHyperGraph. Some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in **Ref. [HG39]** by Henry Garrett (2022) which is indexed by Google Scholar and has more than 3230 readers in Scribd. It's titled "Beyond Neutrosophic Graphs" and published by Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United State. This research book covers different types of notions and settings in neutrosophic graph theory and neutrosophic SuperHyperGraph theory. Also, some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in **Ref. [HG40]** by Henry Garrett (2022) which is indexed by Google Scholar and has more than 4117 readers in Scribd. It's titled "Neutrosophic Duality" and published by Florida: GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. This research book presents different types of notions SuperHyperResolving and SuperHyperDominating in the setting of duality in neutrosophic graph theory and neutrosophic SuperHyperGraph theory. This research book has scrutiny on the complement of the intended set and the intended set, simultaneously. It's smart to consider a set but acting on its complement that what's done in this research book which is popular in the terms of high readers in Scribd. See the seminal scientific researches [**HG1; HG2; HG3**]. The formalization of the notions on the framework of notions in SuperHyperGraphs, Neutrosophic notions in SuperHyperGraphs theory, and (Neutrosophic) SuperHyperGraphs theory at [**HG4; HG5; HG6; HG7; HG8; HG9; HG10; HG11; HG12; HG13; HG14; HG15; HG16; HG17; HG18; HG19; HG20; HG21; HG22; HG23; HG24; HG25; HG26; HG27; HG28; HG29; HG30; HG31; HG32; HG33; HG34; HG35; HG36; HG37; HG38; HG94; HG942; HG95; HG952; HG96; HG962; HG97; HG972; HG98; HG982; HG106; HG107; HG111; HG112; HG115; HG116; HG120; HG121; HG122; HG123; HG124; HG125; HG126; HG127; HG128; HG129; HG130; HG131; HG132; HG134; HG135; HG136; HG137; HG138; HG139; HG140; HG141; HG142; HG143; HG144; HG145; HG146; HG147; HG148; HG149; HG150; HG151; HG152; HG153; HG154; HG155; HG156; HG157; HG158; HG159; HG160; HG161; HG162; HG163; HG164; HG165; HG166; HG167; HG168; HG169; HG170; HG171; HG172; HG173; HG174; HG175; HG176; HG177; HG178; HG179; HG180; HG181; HG182; HG183; HG184; HG185; HG186; HG187; HG188; HG189; HG190; HG191; HG192; HG193; HG194; HG195; HG196; HG197; HG198; HG199; HG200; HG201**]. Two popular scientific research books in Scribd in the terms of high readers, 3230 and 4117 respectively, on neutrosophic science is on [**HG39; HG40**].



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## CHAPTER 44

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### Books' Contributions

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**[HG202]**

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Henry Garrett, “New Ideas On Super Decompensation By Hyper Decompress Of Vertex-Decomposition In Cancer's Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.18468.76169).

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**[TITLE]** “New Ideas On Super Decompensation By Hyper Decompress Of Vertex-Decomposition In Cancer's Recognition With (Neutrosophic) SuperHyperGraph”

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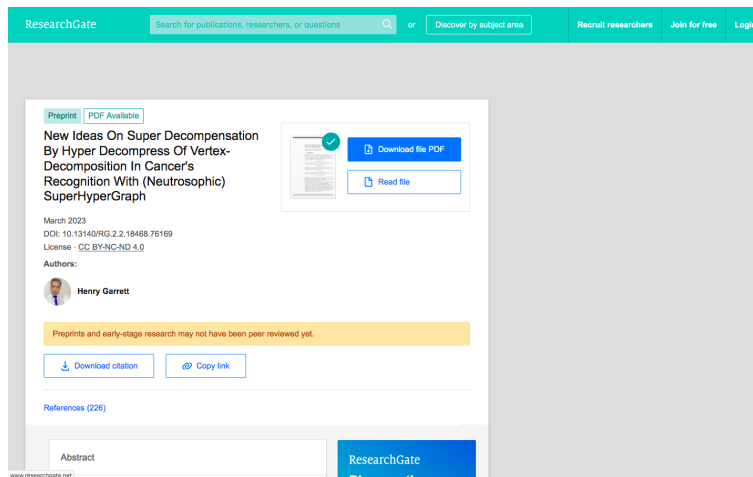


Figure 44.1: Henry Garrett, “New Ideas On Super Decompensation By Hyper Decompress Of Vertex-Decomposition In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.18468.76169).

#### [ADDRESSED CITATION]

Henry Garrett, “New Ideas On Super Decompensation By Hyper Decompress Of Vertex-Decomposition In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.18468.76169).

[ASSIGNED NUMBER] #202nd Article

[DATE] March 2023

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[PROJECT] Neutrosophic SuperHyperGraphs and SuperHyperGraphs

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#### [HG203]

Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Vertex-Decomposition As Hyper Decompress On Super Decompensation”, ResearchGate 2023, (doi: 10.13140/RG.2.2.30212.81289).

[TITLE] “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Vertex-Decomposition As Hyper Decompress On Super Decompensation”

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## New Ideas On Super Decomposition By Hyper Decompress Of Vertex- Decomposition In Cancer's Recognition With (Neutrosophic) SuperHyperGraph

Preprint · March 2023  
DOI: 10.13140/RG.2.2.18468.76169

CITATIONS  
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1 author:



Some of the authors of this publication are also working on these related projects:

[Metric Dimension in fuzzy\(neutrosophic\) Graphs](#) [View project](#)

[On Combinatorics](#) [View project](#)

Figure 44.2: Henry Garrett, “New Ideas On Super Decomposition By Hyper Decompress Of Vertex-Decomposition In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.18468.76169).

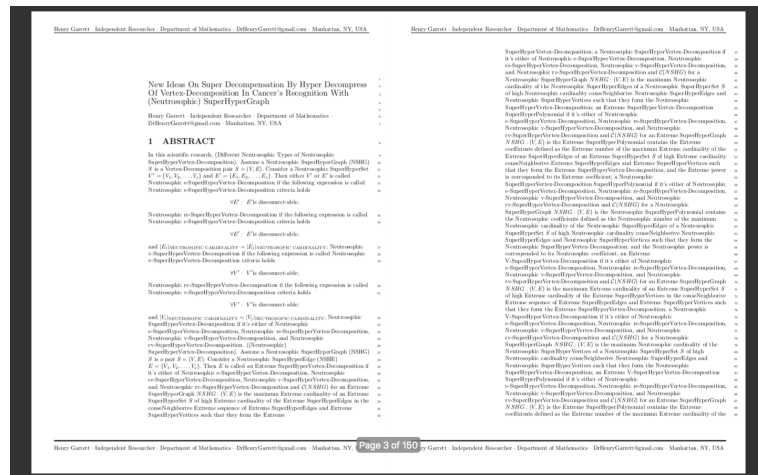


Figure 44.3: Henry Garrett, “New Ideas On Super Decomposition By Hyper Decompress Of Vertex-Decomposition In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.18468.76169).

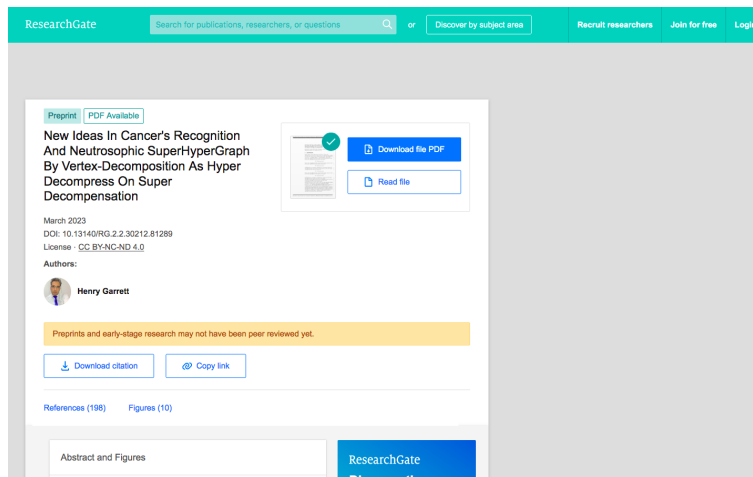


Figure 44.4: Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Vertex-Decomposition As Hyper Decompress On Super Decomensation”, ResearchGate 2023, (doi: 10.13140/RG.2.2.30212.81289).

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Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By	8002
Vertex-Decomposition As Hyper Decompress On Super Decomensation”, ResearchGate 2023,	8003
(doi: 10.13140/RG.2.2.30212.81289).	8004
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[DATE] March 2023	8006
[DOI] 10.13140/RG.2.2.30212.81289	8007
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[PROJECT] Neutrosophic SuperHyperGraphs and SuperHyperGraphs	8009
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## New Ideas In Cancer's Recognition And Neutrosophic SuperHyperGraph By Vertex-Decomposition As Hyper Decompress On Super Decompenation

Preprint · March 2023  
DOI: 10.13140/RG.2.2.30212.81289

CITATIONS  
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1 author:



Some of the authors of this publication are also working on these related projects:

- On Fuzzy Logic View project
- Neutrosophic Graphs View project

Figure 44.5: Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Vertex-Decomposition As Hyper Decompress On Super Decompenation”, ResearchGate 2023, (doi: 10.13140/RG.2.2.30212.81289).

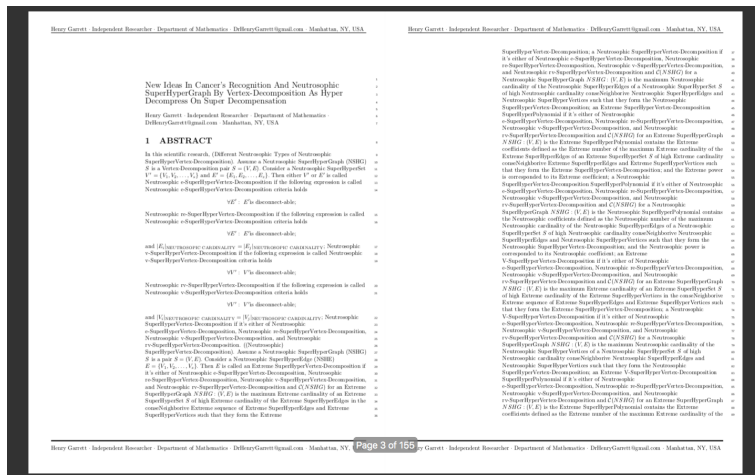


Figure 44.6: Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Vertex-Decomposition As Hyper Decompress On Super Decompenation”, ResearchGate 2023, (doi: 10.13140/RG.2.2.30212.81289).



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<b>[TITLE] Vertex-Decomposition In SuperHyperGraphs</b>	8031
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## Vertex-Cut In SuperHyperGraphs

Book · March 2023

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Some of the authors of this publication are also working on these related projects:



Figure 44.7: “#135th Book” || Vertex-Decomposition In SuperHyperGraphs February 2023  
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[POSTED BY] Dr. Henry Garrett	8096
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[DATE] March 019, 2023	8098
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[POSTED IN] 0136   Vertex-Decomposition In SuperHyperGraphs	8100
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SuperHyperModeling, SuperHyperVertices, Theoretical Research, Vertex, Vertices.	8113

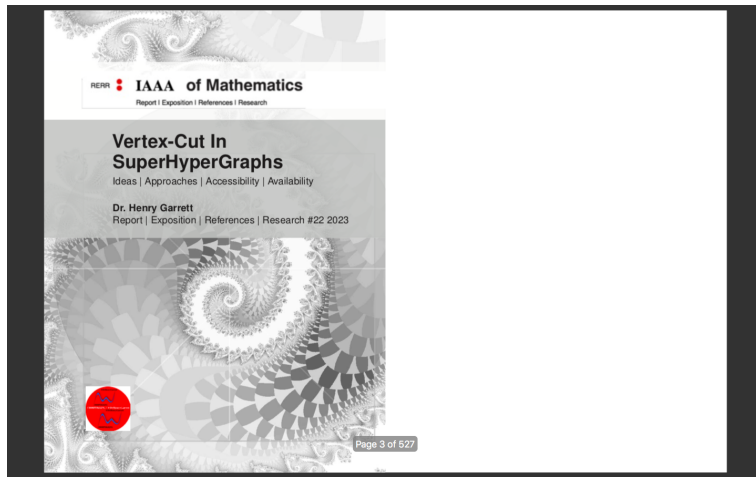


Figure 44.8: “#135th Book” || Vertex-Decomposition In SuperHyperGraphs February 2023  
License: CC BY-NC-ND 4.0 Project: Neutrosophic SuperHyperGraphs and SuperHyperGraphs

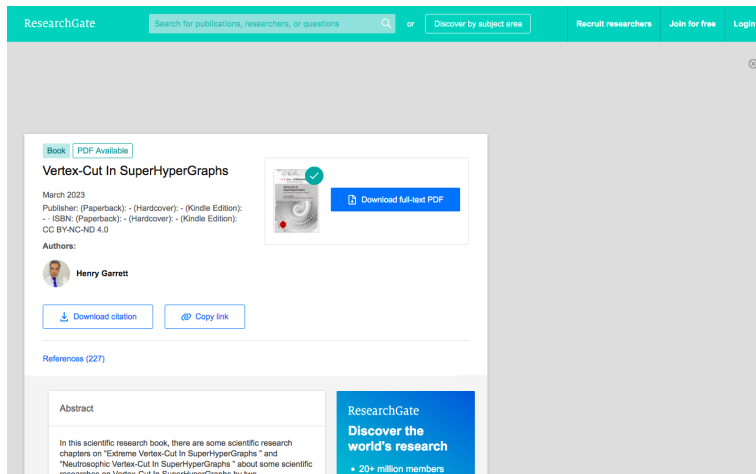


Figure 44.9: “#135th Book” || Vertex-Decomposition In SuperHyperGraphs February 2023  
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In this scientific research book, there are some scientific research chapters on “Extreme an 8114  
Extreme In SuperHyperGraphs” and “Neutrosophic an Extreme In SuperHyperGraphs” about 8115  
some researches on Extreme an Extreme In SuperHyperGraphs and neutrosophic an Extreme 8116  
In SuperHyperGraphs. 8117

## CHAPTER 45

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### **“SuperHyperGraph-Based Books”: | Featured Tweets**

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“SuperHyperGraph-Based Books”: | Featured Tweets

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Project

ResearchGate

## Neutrosophic SuperHyperGraphs and SuperHyperGraphs

 Henry Garrett

Goal: The aim of this project is to contribute some research articles and some research books in that subject. Finding tools and notions to define in this structure to make this structure more understandable. Clarifications are presented in oversimplified ways. There are well-defined efforts to get more sensible results.

Sometimes, I post one part of book at my website. After that, I put that link in this project. Some research articles and some research books are excerpt from these posts.

Instance updates are on my accounts, simultaneously [Website, Scribd, Twitter, Amazon, Academia, LinkedIn, Twitter, ResearchGate.].

I've listed my accounts below.

-My website [Covering all my contributions containing articles and books as free access to download with PDF extension and more]: <https://drhenrygarrett.wordpress.com>

-Amazon [Some of my all books, here]: <https://www.amzn.com/author/drhenrygarrett>

-Twitter: @DrHenryGarrett ([www.twitter.com/DrHenryGarrett](http://www.twitter.com/DrHenryGarrett))

-ResearchGate: <https://www.researchgate.net/profile/Henry-Garrett-2>

-Academia: <https://independent.academia.edu/drhenrygarrett/>

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-LinkedIn: <https://www.linkedin.com/in/drhenrygarrett/>

Figure 45.1: “SuperHyperGraph-Based Books”: | Featured Tweets

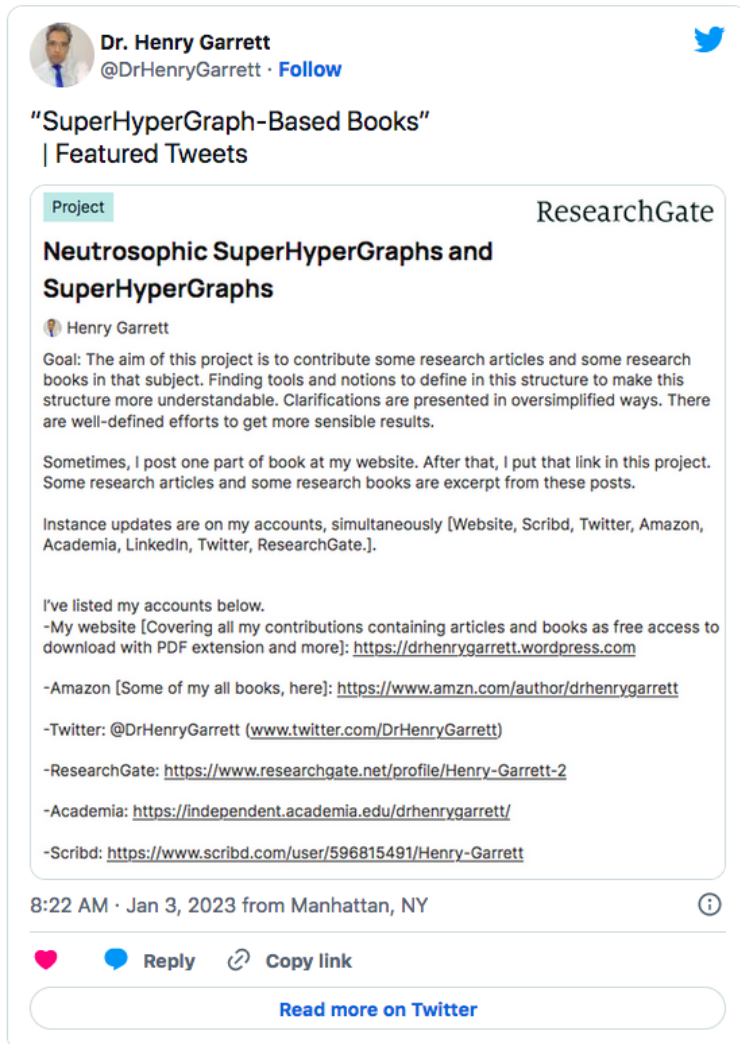


Figure 45.2: "SuperHyperGraph-Based Books": | Featured Tweets



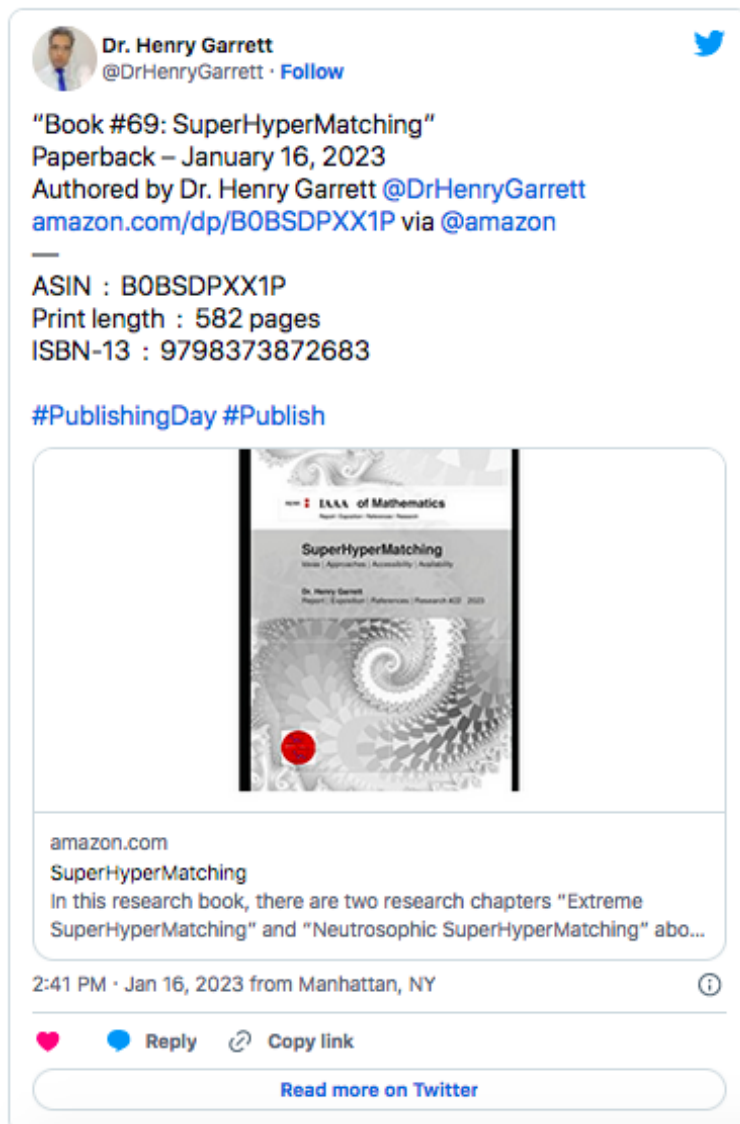


Figure 45.3: "SuperHyperGraph-Based Books": | Featured Tweets #69



Figure 45.4: "SuperHyperGraph-Based Books": | Featured Tweets #69

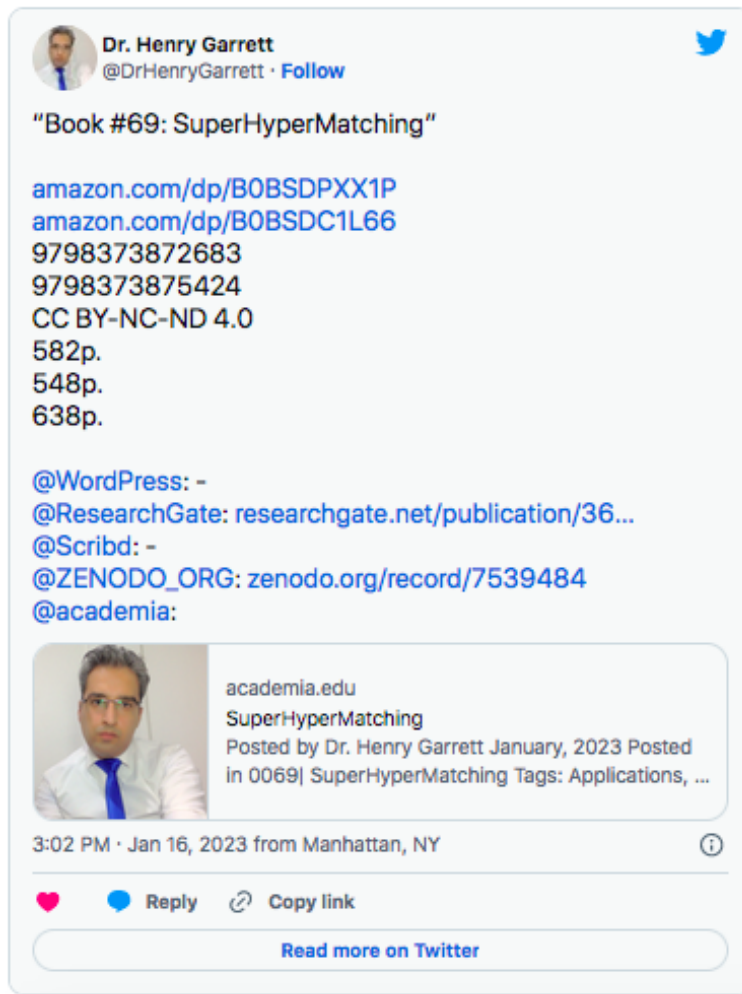


Figure 45.5: "SuperHyperGraph-Based Books": | Featured Tweets #69



Figure 45.6: "SuperHyperGraph-Based Books": | Featured Tweets #68



Figure 45.7: "SuperHyperGraph-Based Books": | Featured Tweets #68



Figure 45.8: "SuperHyperGraph-Based Books": | Featured Tweets #68

Publications: Books		
2023	0068   Failed SuperHyperClique	Amazon
» ASIN : B0BRZ67NYN Publisher : Independently published (January 10, 2023) Language : English Paperback : 454 pages ISBN-13 : 979-8373274227 Item Weight : 2.83 pounds Dimensions : 8.5 x 1.07 x 11 inches		
» ASIN : B0BRYZTK24 Publisher : Independently published (January 10, 2023) Language : English Hardcover : 460 pages ISBN-13 : 979-8373277273 Item Weight : 2.78 pounds Dimensions : 8.25 x 1.27 x 11 inches		

Figure 45.9: “SuperHyperGraph-Based Books”: | Featured Tweets #68



Figure 45.10: “SuperHyperGraph-Based Books”: | Featured Tweets #67



Figure 45.11: "SuperHyperGraph-Based Books": | Featured Tweets #67



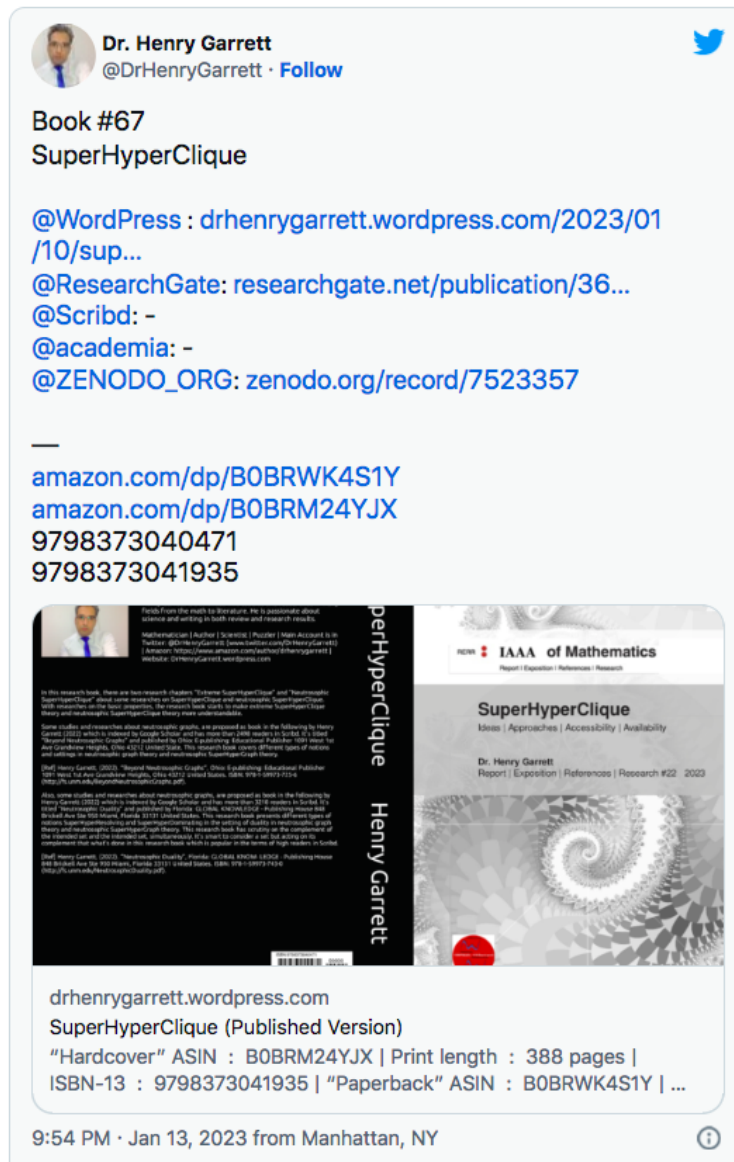


Figure 45.12: “SuperHyperGraph-Based Books”: | Featured Tweets #67

Publications: Books

2023	0067   SuperHyperClique	Amazon
» ASIN : B0BRWK4S1Y Publisher : Independently published (January 8, 2023) Language : English Paperback : 376 pages ISBN-13 : 979-8373040471 Item Weight : 2.36 pounds Dimensions : 8.5 x 0.89 x 11 inches		
» ASIN : B0BRM24YJX Publisher : Independently published (January 8, 2023) Language : English Hardcover : 388 pages ISBN-13 : 979-8373041935 Item Weight : 2.36 pounds Dimensions : 8.25 x 1.1 x 11 inches		

Figure 45.13: “SuperHyperGraph-Based Books”: | Featured Tweets #67



Figure 45.14: “SuperHyperGraph-Based Books”: | Featured Tweets #66



Figure 45.15: “SuperHyperGraph-Based Books”: | Featured Tweets #66

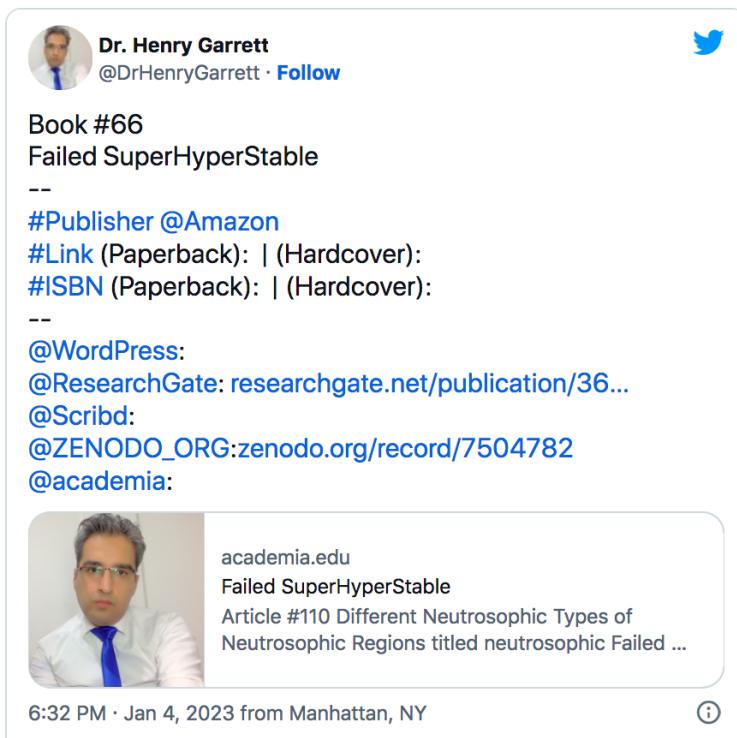


Figure 45.16: “SuperHyperGraph-Based Books”: | Featured Tweets #66

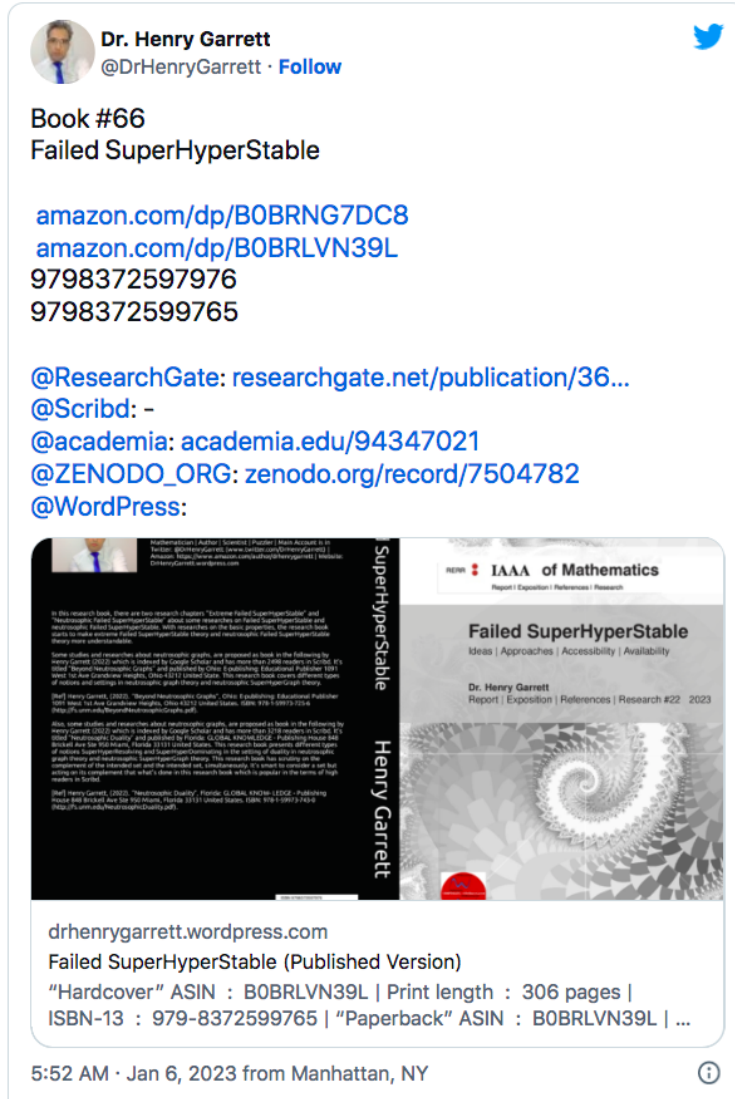


Figure 45.17: "SuperHyperGraph-Based Books": | Featured Tweets #66

Publications: Books		
2023	0066   Failed SuperHyperStable	Amazon
» ASIN : B0BRNG7DC8 Publisher : Independently published (January 4, 2023) Language : English Paperback : 304 pages ISBN-13 : 979-8372597976 Item Weight : 1.93 pounds Dimensions : 8.5 x 0.72 x 11 inches		
» ASIN : B0BRLVN39L Publisher : Independently published (January 4, 2023) Language : English Hardcover : 306 pages ISBN-13 : 979-8372599765 Item Weight : 1.89 pounds Dimensions : 8.25 x 0.91 x 11 inches		

Figure 45.18: "SuperHyperGraph-Based Books": | Featured Tweets #66



Figure 45.19: “SuperHyperGraph-Based Books”: | Featured Tweets #65

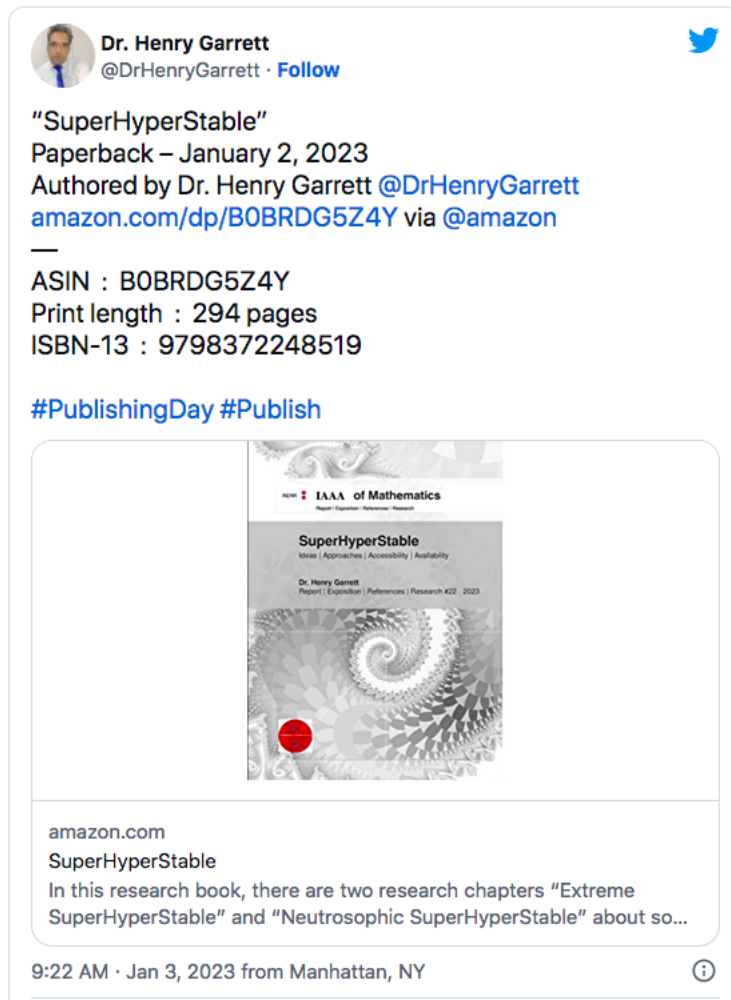


Figure 45.20: "SuperHyperGraph-Based Books": | Featured Tweets #65

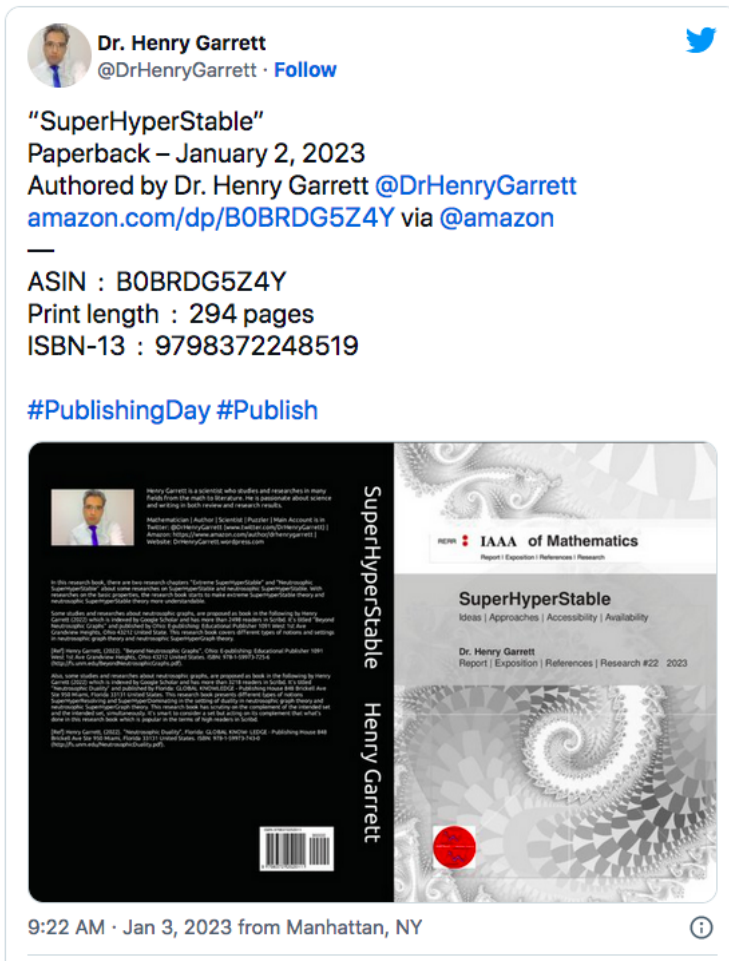


Figure 45.21: “SuperHyperGraph-Based Books”: | Featured Tweets #65





Figure 45.22: "SuperHyperGraph-Based Books": | Featured Tweets #65

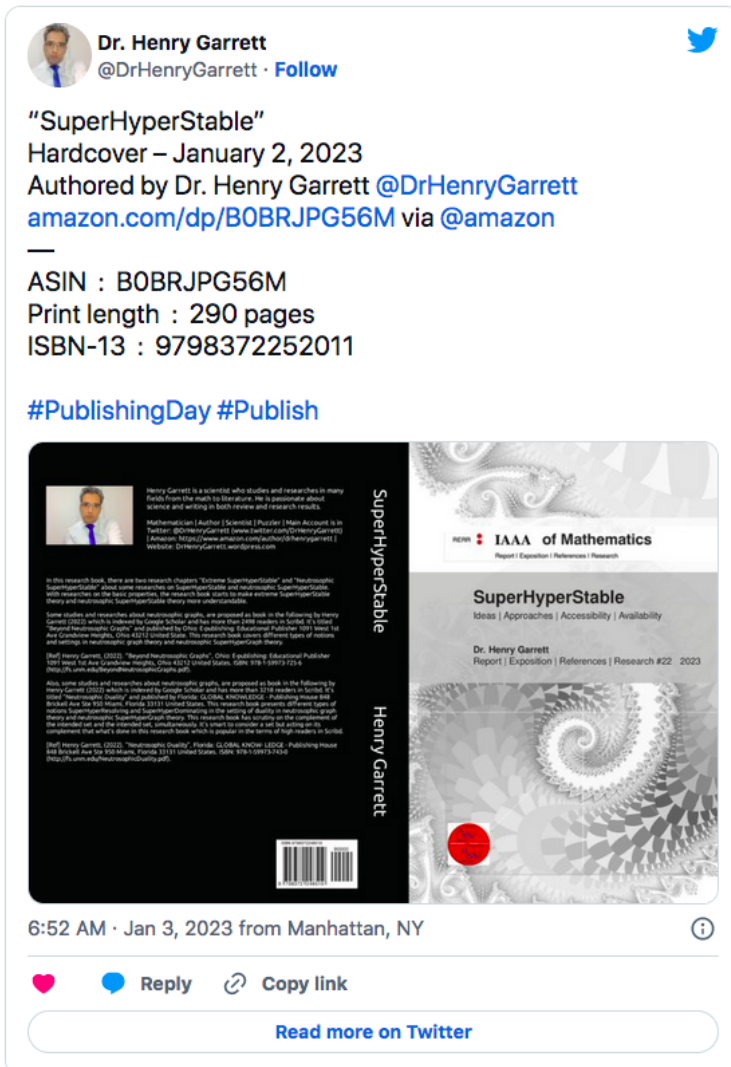


Figure 45.23: “SuperHyperGraph-Based Books”: | Featured Tweets #65



Figure 45.24: “SuperHyperGraph-Based Books”: | Featured Tweets #65



Figure 45.25: “SuperHyperGraph-Based Books”: | Featured Tweets #64



Figure 45.26: “SuperHyperGraph-Based Books”: | Featured Tweets #63



Figure 45.27: “SuperHyperGraph-Based Books”: | Featured Tweets #62

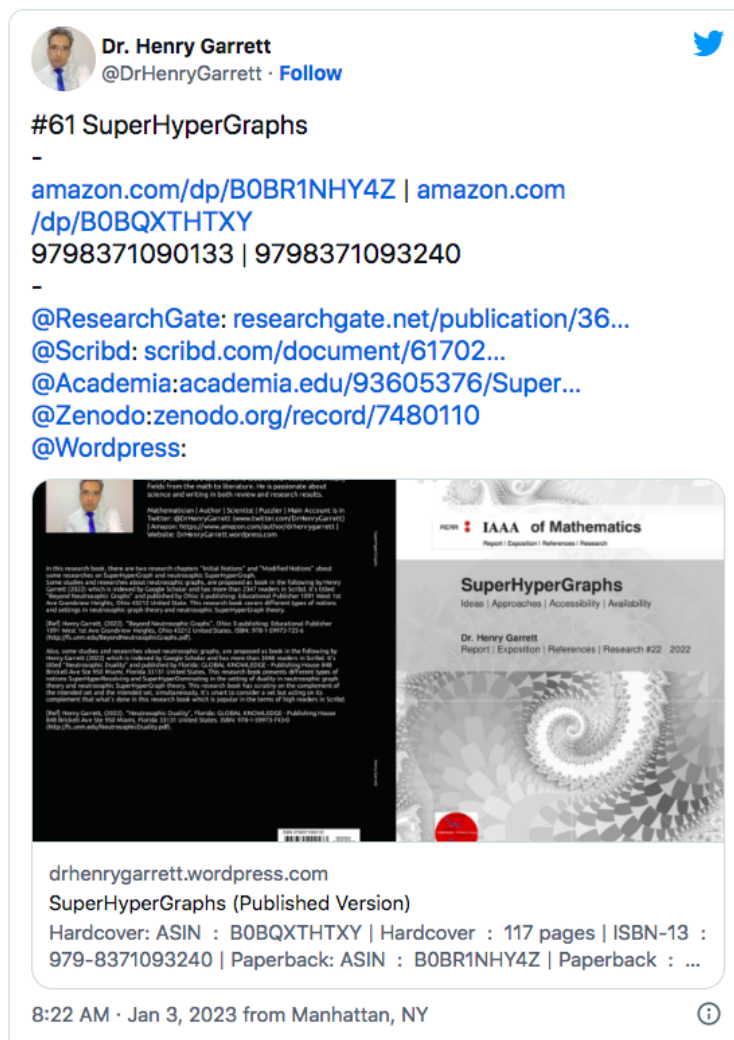


Figure 45.28: “SuperHyperGraph-Based Books”: | Featured Tweets #61



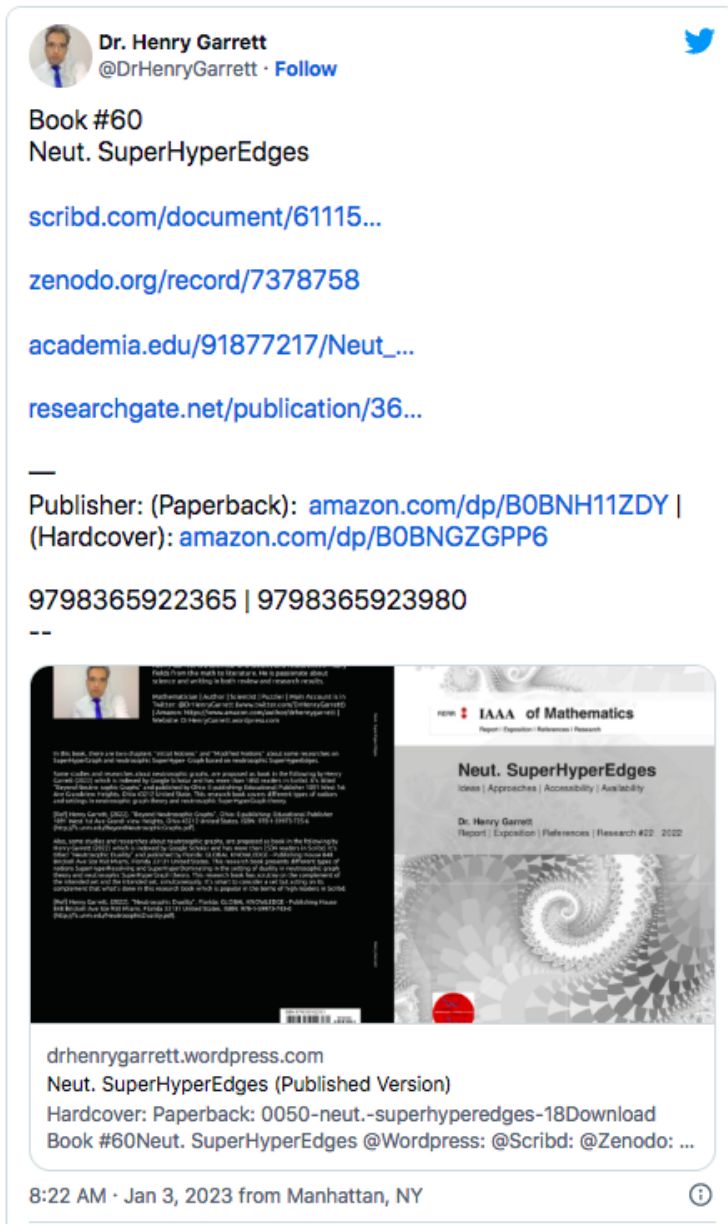


Figure 45.29: “SuperHyperGraph-Based Books”: | Featured Tweets #60





## CHAPTER 46

8122

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# CV

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8123

# Henry Garrett | CV

- » **Status:** Known As Henry Garrett With Highly Productive Style.
- » **Fields:** Combinatorics, Algebraic Structures, Algebraic Hyperstructures, Fuzzy Logic
- » **Prefers:** Graph Theory, Domination, Metric Dimension, Neutrosophic Graph Theory, Neutrosophic Domination, Lattice Theory, Groups and Hypergroups
- » **Activities:** Traveling, Painting, Writing, Reading books and Papers



## Professional Experiences

- |   |                   |     |
|---|-------------------|-----|
| 2017 - Present  | Continuous Member | AMS |
| <ul style="list-style-type: none"> <li>» I tried to show them that Science is not only interesting, it's beautiful and exciting.</li> <li>» Participating in the academic space of the largest mathematical Society gave me valuable experiences. The use of Bulletin and Notice of the American Mathematical Society is another benefit of this presence.</li> </ul> |                   |     |
| 2017 - 2019   | Continuous Member | EMS |
| <ul style="list-style-type: none"> <li>» The use Newsletter of the European Mathematical Society is benefit of this membership.</li> <li>» I am interested in giving a small, though small, effect on math epidemic progress</li> </ul>   |                   |     |

## Awards and Achievements

- |  |  |  |
|--|--|--|
| Dec 2022   | Award: Selected as a Reviewer                                    | @SciencePG                                     |
| <ul style="list-style-type: none"> <li>» Award: Selected as Reviewer to Journal of American Journal of Computer Science and Technology, Science Publishing Group, USA, @SciencePG: <a href="https://www.sciencepublishinggroup.com/journal/index?journalid=303">https://www.sciencepublishinggroup.com/journal/index?journalid=303</a></li> <li>» American Journal of Computer Science and Technology, Science Publishing Group, USA, @SciencePG: <a href="https://www.sciencepublishinggroup.com/journal/index?journalid=303">https://www.sciencepublishinggroup.com/journal/index?journalid=303</a>; PDF: <a href="https://drhenrygarrett.files.wordpress.com/2023/02/certificate_for_reviewer-2.pdf">https://drhenrygarrett.files.wordpress.com/2023/02/certificate_for_reviewer-2.pdf</a></li> </ul> |  |  |
| Sep 2022   | Award: Selected as an Editorial Board Member to JMTCM            | JMTCM  |
| <ul style="list-style-type: none"> <li>» Award: Selected as an Editorial Board Member to Journal of Mathematical Techniques and Computational Mathematics(JMTCM)</li> <li>» Journal of Mathematical Techniques and Computational Mathematics(JMTCM)</li> </ul>   |  |  |
| Jun 2022   | Award: Selected as an Editorial Board Member to JCTCSR           | JCTCSR   |
| <ul style="list-style-type: none"> <li>» Award: Selected as an Editorial Board Member to Journal of Current Trends in Computer Science Research(JCTCSR)</li> <li>» Journal of Current Trends in Computer Science Research(JCTCSR)</li> </ul>   |  |  |
| Jan 23, 2022   | Award: Diploma By Neutrosophic Science International Association | Neutrosophic Science International Association |
| <ul style="list-style-type: none"> <li>» Award: Distinguished Achievements</li> <li>» Honorary Membership; PDF: <a href="https://drhenrygarrett.files.wordpress.com/2023/02/neutrosophicdiploma-henry-garrett.pdf">https://drhenrygarrett.files.wordpress.com/2023/02/neutrosophicdiploma-henry-garrett.pdf</a></li> </ul>   |  |  |

## Journal Referee

- |          |                                 |       |
|----------|---------------------------------|-------|
| Sep 2022 | Editorial Board Member to JMTCM | JMTCM |
|----------|---------------------------------|-------|

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» Editorial Board Member to Journal of Mathematical Techniques and Computational Mathematics(JMTCM)

» Journal of Mathematical Techniques and Computational Mathematics(JMTCM)

Jun 2022

Editorial Board Member to JCTCSR

[JCTCSR](#)

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» Editorial Board Member to Journal of Current Trends in Computer Science Research(JCTCSR)

» Journal of Current Trends in Computer Science Research(JCTCSR)

### Publications: Articles

2023	184	Manuscript
<p>» Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Space As Hyper Sparse On Super Spark”, ResearchGate 2023, (doi: 10.13140/RG.2.2.21756.21129).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369086888">https://www.researchgate.net/publication/369086888</a>            @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>            @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7708851">https://zenodo.org/record/7708851</a>            @academia: <a href="https://www.academia.edu/98165095">https://www.academia.edu/98165095</a></p>		
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<p>» Henry Garrett, “New Ideas On Super Solidarity By Hyper Soul Of Space In Cancer’s Recognition With (Extreme) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.30983.68009).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369087468">https://www.researchgate.net/publication/369087468</a>            @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>            @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7709005">https://zenodo.org/record/7709005</a>            @academia: <a href="https://www.academia.edu/98167776">https://www.academia.edu/98167776</a></p>		
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<p>» Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Edge-Connectivity As Hyper Disclosure On Super Closure”, ResearchGate 2023, (doi: 10.13140/RG.2.2.28552.29445).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369058636">https://www.researchgate.net/publication/369058636</a>            @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>            @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7706177">https://zenodo.org/record/7706177</a>            @academia: <a href="https://www.academia.edu/98107686">https://www.academia.edu/98107686</a></p>		
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<p>» Henry Garrett, “New Ideas On Super Uniform By Hyper Deformation Of Edge-Connectivity In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.10936.21761).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369059966">https://www.researchgate.net/publication/369059966</a>            @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>            @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7706254">https://zenodo.org/record/7706254</a>            @academia: <a href="https://www.academia.edu/98108721">https://www.academia.edu/98108721</a></p>		
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<p>» Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Vertex-Connectivity As Hyper Leak On Super Structure”, ResearchGate 2023, (doi: 10.13140/RG.2.2.35105.89447).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369051049">https://www.researchgate.net/publication/369051049</a>            @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>            @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7705887">https://zenodo.org/record/7705887</a>            @academia: <a href="https://www.academia.edu/98103871">https://www.academia.edu/98103871</a></p>		
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		<p>» Henry Garrett, “New Ideas On Super System By Hyper Explosions Of Vertex-Connectivity In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.30072.72960).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369052717">https://www.researchgate.net/publication/369052717</a>          @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>          @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7705951">https://zenodo.org/record/7705951</a>          @academia: <a href="https://www.academia.edu/98104801">https://www.academia.edu/98104801</a></p>
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		<p>» Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Tree-Decomposition As Hyper Forward On Super Returns”, ResearchGate 2023, (doi: 10.13140/RG.2.2.31147.52003).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369029627">https://www.researchgate.net/publication/369029627</a>          @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>          @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7701758">https://zenodo.org/record/7701758</a>          @academia: <a href="https://www.academia.edu/98023078">https://www.academia.edu/98023078</a></p>
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		<p>» Henry Garrett, “New Ideas On Super Nodes By Hyper Moves Of Tree-Decomposition In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.32825.24163).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369030046">https://www.researchgate.net/publication/369030046</a>          @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>          @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7701796">https://zenodo.org/record/7701796</a>          @academia: <a href="https://www.academia.edu/98024333">https://www.academia.edu/98024333</a></p>
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		<p>» Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By Chord As Hyper Excellence On Super Excess”, ResearchGate 2023, (doi: 10.13140/RG.2.2.13059.58401).</p> <p>»</p> <p>@ResearchGate: <a href="https://www.researchgate.net/publication/369019923">https://www.researchgate.net/publication/369019923</a>          @Scribd: <a href="https://www.scribd.com/document/629520682">https://www.scribd.com/document/629520682</a>          @ZENODO<sub>ORG</sub> : <a href="https://zenodo.org/record/7699943">https://zenodo.org/record/7699943</a>          @academia: <a href="https://www.academia.edu/97971843">https://www.academia.edu/97971843</a></p>
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» Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By SuperHyper(i,j)-Domination As Hyper Controller On Super Waves”, ResearchGate 2023, (doi: 10.13140/RG.2.2.22011.80165).

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» Henry Garrett, “New Ideas In Cancer’s Recognition And Neutrosophic SuperHyperGraph By SuperHyperEdge-Domination As Hyper Reversion On Super Indirection”, ResearchGate 2023, (doi: 10.13140/RG.2.2.10493.84962).

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» Henry Garrett, “New Ideas On Super Harmony By Hyper k-Function Of SuperHyperK-Domination In Cancer’s Recognition With (Neutrosophic) SuperHyperGraph”, ResearchGate 2023, (doi: 10.13140/RG.2.2.23299.58404).

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2023	<p>0110   Different Neutrosophic Types of Neutrosophic Regions titled neutrosophic Failed SuperHyperStable in Cancer's Neutrosophic Recognition modeled in the Form of Neutrosophic SuperHyperGraphs</p> <p>» Henry Garrett, “Different Neutrosophic Types of Neutrosophic Regions titled neutrosophic Failed SuperHyperStable in Cancer’s Neutrosophic Recognition modeled in the Form of Neutrosophic SuperHyperGraphs”, ResearchGate 2023, (doi: 10.13140/RG.2.2.17385.36968).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0109   0039   Closing Numbers and Super-Closing Numbers as (Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-SuperHyperGraph</p> <p>» Garrett, Henry. “0039   Closing Numbers and Super-Closing Numbers as (Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-SuperHyperGraph.” CERN European Organization for Nuclear Research - Zenodo, Nov. 2022. CERN European Organization for Nuclear Research, <a href="https://doi.org/10.5281/zenodo.6319942">https://doi.org/10.5281/zenodo.6319942</a>.</p> <p><a href="https://oa.mg/work/10.5281/zenodo.6319942">https://oa.mg/work/10.5281/zenodo.6319942</a></p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0108   0049   (Failed)1-Zero-Forcing Number in Neutrosophic Graphs</p> <p>» Garrett, Henry. “0049   (Failed)1-Zero-Forcing Number in Neutrosophic Graphs.” CERN European Organization for Nuclear Research - Zenodo, Feb. 2022. CERN European Organization for Nuclear Research, <a href="https://doi.org/10.13140/rg.2.2.35241.26724">https://doi.org/10.13140/rg.2.2.35241.26724</a>.</p> <p><a href="https://oa.mg/work/10.13140/rg.2.2.35241.26724">https://oa.mg/work/10.13140/rg.2.2.35241.26724</a></p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2023	<p>0107   Neutrosophic 1-Failed SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer's Neutrosophic Recognition And Beyond</p>	Manuscript

	<p>» Henry Garrett, “Neutrosophic 1-Failed SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer’s Neutrosophic Recognition And Beyond”, Preprints 2023, 2023010044</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2023	<p>0106   (Neutrosophic) SuperHyperStable on Cancer’s Recognition by Well-SuperHyperModelled (Neutrosophic) SuperHyperGraphs</p> <p>» Henry Garrett, “(Neutrosophic) SuperHyperStable on Cancer’s Recognition by Well-SuperHyperModelled (Neutrosophic) SuperHyperGraphs”, Preprints 2023, 2023010043 (doi: 10.20944/preprints202301.0043.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>Article105 (JMTCM)</p> <p>» Henry Garrett, “Super Hyper Dominating and Super Hyper Resolving on Neutrosophic Super Hyper Graphs and Their Directions in Game Theory and Neutrosophic Super Hyper Classes”, J Math Techniques Comput Math 1(3) (2022) 242-263. (doi: 10.33140/JMTCM.01.03.09).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Article
2023	<p>0104   Using the Tool As (Neutrosophic) Failed SuperHyperStable To SuperHyperModel Cancer’s Recognition Titled (Neutrosophic) SuperHyperGraphs</p> <p>» Henry Garrett, “Using the Tool As (Neutrosophic) Failed SuperHyperStable To SuperHyperModel Cancer’s Recognition Titled (Neutrosophic) SuperHyperGraphs”, ResearchGate 2023, (doi: 10.13140/RG.2.2.28945.92007).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2023	<p>0103   Neutrosophic Messy-Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer’s Neutrosophic Recognitions In Special ViewPoints</p> <p>» Henry Garrett, “Neutrosophic Messy-Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer’s Neutrosophic Recognitions In Special ViewPoints”, ResearchGate 2023, (doi: 10.13140/RG.2.2.11447.80803).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2023	<p>0102   (Neutrosophic) SuperHyperStable on Cancer’s Recognition by Well-SuperHyperModelled (Neutrosophic) SuperHyperGraphs</p> <p>» Henry Garrett, “(Neutrosophic) SuperHyperStable on Cancer’s Recognition by Well-SuperHyperModelled (Neutrosophic) SuperHyperGraphs”, ResearchGate 2023, (doi: 10.13140/RG.2.2.35774.77123).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0101   Neutrosophic 1-Failed SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer’s Neutrosophic Recognition And Beyond</p> <p>» Henry Garrett, “Neutrosophic 1-Failed SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer’s Neutrosophic Recognition And Beyond”, ResearchGate 2022, (doi: 10.13140/RG.2.2.36141.77287).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0100   (Neutrosophic) 1-Failed SuperHyperForcing in Cancer’s Recognitions And (Neutrosophic) SuperHyperGraphs</p> <p>» Henry Garrett, “(Neutrosophic) 1-Failed SuperHyperForcing in Cancer’s Recognitions And (Neutrosophic) SuperHyperGraphs”, ResearchGate 2022, (doi: 10.13140/RG.2.2.29430.88642).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0099   Basic Notions on (Neutrosophic) SuperHyperForcing And (Neutrosophic) SuperHyperModeling in Cancer’s Recognitions And (Neutrosophic) SuperHyperGraphs</p> <p>» Henry Garrett, “Basic Notions on (Neutrosophic) SuperHyperForcing And (Neutrosophic) SuperHyperModeling in Cancer’s Recognitions And (Neutrosophic) SuperHyperGraphs”, ResearchGate 2022, (doi: 10.13140/RG.2.2.11369.16487).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0098   (Neutrosophic) SuperHyperModeling of Cancer’s Recognitions Featuring (Neutrosophic) SuperHyperDefensive SuperHyperAlliances</p>	Manuscript

	<p>» Henry Garrett, “(Neutrosophic) SuperHyperModeling of Cancer’s Recognitions Featuring (Neutrosophic) SuperHyperDefensive SuperHyperAlliances”, Preprints 2022, 2022120549 (doi: 10.20944/preprints202212.0549.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	<p>0098   (Neutrosophic) SuperHyperModeling of Cancer’s Recognitions Featuring (Neutrosophic) SuperHyperDefensive SuperHyperAlliances</p> <p>» Henry Garrett, “(Neutrosophic) SuperHyperModeling of Cancer’s Recognitions Featuring (Neutrosophic) SuperHyperDefensive SuperHyperAlliances”, ResearchGate 2022, (doi: 10.13140/RG.2.2.19380.94084).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0097   (Neutrosophic) SuperHyperAlliances With SuperHyperDefensive and SuperHyperOffensive Type-SuperHyperSet On (Neutrosophic) SuperHyperGraph With (Neutrosophic) SuperHyperModeling of Cancer’s Recognitions And Related (Neutrosophic) SuperHyperClasses</p> <p>» Henry Garrett, “(Neutrosophic) SuperHyperAlliances With SuperHyperDefensive and SuperHyperOffensive Type-SuperHyperSet On (Neutrosophic) SuperHyperGraph With (Neutrosophic) SuperHyperModeling of Cancer’s Recognitions And Related (Neutrosophic) SuperHyperClasses”, Preprints 2022, 2022120540 (doi: 10.20944/preprints202212.0540.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0097   (Neutrosophic) SuperHyperAlliances With SuperHyperDefensive and SuperHyperOffensive Type-SuperHyperSet On (Neutrosophic) SuperHyperGraph With (Neutrosophic) SuperHyperModeling of Cancer’s Recognitions And Related (Neutrosophic) SuperHyperClasses</p> <p>» Henry Garrett, “(Neutrosophic) SuperHyperAlliances With SuperHyperDefensive and SuperHyperOffensive Type-SuperHyperSet On (Neutrosophic) SuperHyperGraph With (Neutrosophic) SuperHyperModeling of Cancer’s Recognitions And Related (Neutrosophic) SuperHyperClasses”, ResearchGate 2022, (doi: 10.13140/RG.2.2.14426.41923).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0096   SuperHyperGirth on SuperHyperGraph and Neutrosophic SuperHyperGraph With SuperHyperModeling of Cancer’s Recognitions</p> <p>» Henry Garrett, “SuperHyperGirth on SuperHyperGraph and Neutrosophic SuperHyperGraph With SuperHyperModeling of Cancer’s Recognitions”, Preprints 2022, 2022120500 (doi: 10.20944/preprints202212.0500.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0096   SuperHyperGirth on SuperHyperGraph and Neutrosophic SuperHyperGraph With SuperHyperModeling of Cancer’s Recognitions</p> <p>» Henry Garrett, “SuperHyperGirth on SuperHyperGraph and Neutrosophic SuperHyperGraph With SuperHyperModeling of Cancer’s Recognitions”, ResearchGate 2022 (doi: 10.13140/RG.2.2.20993.12640).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0095   Some SuperHyperDegrees and Co-SuperHyperDegrees on Neutrosophic SuperHyperGraphs and SuperHyperGraphs Alongside Applications in Cancer’s Treatments</p> <p>» Henry Garrett, “Some SuperHyperDegrees and Co-SuperHyperDegrees on Neutrosophic SuperHyperGraphs and SuperHyperGraphs Alongside Applications in Cancer’s Treatments”, Preprints 2022, 2022120324 (doi: 10.20944/preprints202212.0324.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0095   Some SuperHyperDegrees and Co-SuperHyperDegrees on Neutrosophic SuperHyperGraphs and SuperHyperGraphs Alongside Applications in Cancer’s Treatments</p> <p>» Henry Garrett, “Some SuperHyperDegrees and Co-SuperHyperDegrees on Neutrosophic SuperHyperGraphs And SuperHyperGraphs Alongside Applications in Cancer’s Treatments”, ResearchGate 2022 (doi: 10.13140/RG.2.2.23123.04641).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript
2022	<p>0094   SuperHyperDominating and SuperHyperResolving on Neutrosophic SuperHyperGraphs And Their Directions in Game Theory and Neutrosophic SuperHyperClasses</p> <p>» Henry Garrett, “SuperHyperDominating and SuperHyperResolving on Neutrosophic SuperHyperGraphs And Their Directions in Game Theory and Neutrosophic SuperHyperClasses”, Preprints 2022, 2022110576 (doi: 10.20944/preprints202211.0576.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	Manuscript

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2022	0094   SuperHyperDominating and SuperHyperResolving on Neutrosophic SuperHyperGraphs And Their Directions in Game Theory and Neutrosophic SuperHyperClasses	Manuscript
	<p>» Henry Garrett, “SuperHyperDominating and SuperHyperResolving on Neutrosophic SuperHyperGraphs And Their Directions in Game Theory and Neutrosophic SuperHyperClasses”, ResearchGate 2022 (doi: 10.13140/RG.2.2.23324.56966).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0093   Neutrosophic Co-degree and Neutrosophic Degree alongside Chromatic Numbers in the Setting of Some Classes Related to Neutrosophic Hypergraphs	Article
	<p>» Henry Garrett, “Neutrosophic Co-degree and Neutrosophic Degree alongside Chromatic Numbers in the Setting of Some Classes Related to Neutrosophic Hypergraphs”, J Curr Trends Comp Sci Res 1(1) (2022) 06-14.</p> <p>PDF, Abstract, Issue.</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0092   Recognition of the Pattern for Vertices to Make Dimension by Resolving in some Classes of Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Recognition of the Pattern for Vertices to Make Dimension by Resolving in some Classes of Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.27281.51046).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0091   Regularity of Every Element to Function in the Type of Domination in Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Regularity of Every Element to Function in the Type of Domination in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.22861.10727).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0090   Initial Material of Neutrosophic Preliminaries to Study Some Neutrosophic Notions Based on Neutrosophic SuperHyperEdge (NSHE) in Neutrosophic SuperHyperGraph (NSHG)	Manuscript
	<p>» Henry Garrett, “Initial Material of Neutrosophic Preliminaries to Study Some Neutrosophic Notions Based on Neutrosophic SuperHyperEdge (NSHE) in Neutrosophic SuperHyperGraph (NSHG)”, ResearchGate 2022 (doi: 10.13140/RG.2.2.25385.88160).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0089   Basic Neutrosophic Notions Concerning Neutrosophic SuperHyperDominating and Neutrosophic SuperHyperResolving in Neutrosophic SuperHyperGraph	Manuscript
	<p>» Henry Garrett, “Basic Neutrosophic Notions Concerning Neutrosophic SuperHyperDominating and Neutrosophic SuperHyperResolving in Neutrosophic SuperHyperGraph”, ResearchGate 2022 (doi: 10.13140/RG.2.2.29173.86244).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0088   Seeking Empty Subgraphs To Determine Different Measurements in Some Classes of Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Seeking Empty Subgraphs To Determine Different Measurements in Some Classes of Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.30448.53766).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0087   Impacts of Isolated Vertices To Cover Other Vertices in Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Impacts of Isolated Vertices To Cover Other Vertices in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.16185.44647).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0086   Perfect Locating of All Vertices in Some Classes of Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Perfect Locating of All Vertices in Some Classes of Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.23971.12326).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0085   Complete Connections Between Vertices in Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Complete Connections Between Vertices in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.28860.10885).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	

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2022	0084   Unique Distance Differentiation By Collection of Vertices in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Unique Distance Differentiation By Collection of Vertices in Neutrosophic Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.17692.77449).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0083   Single Connection Amid Vertices From Two Given Sets Partitioning Vertex Set in Some Classes of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Single Connection Amid Vertices From Two Given Sets Partitioning Vertex Set in Some Classes of Neutrosophic Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.32189.33764).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0082   Separate Joint-Sets Representing Separate Numbers Where Classes of Neutrosophic Graphs and Applications are Cases of Study	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Separate Joint-Sets Representing Separate Numbers Where Classes of Neutrosophic Graphs and Applications are Cases of Study", ResearchGate 2022 (doi: 10.13140/RG.2.2.22666.95686).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0081   Repetitive Joint-Sets Featuring Multiple Numbers For Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Repetitive Joint-Sets Featuring Multiple Numbers For Neutrosophic Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.15113.93283).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0080   Dual-Resolving Numbers Excerpt from Some Classes of Neutrosophic Graphs With Some Applications	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Dual-Resolving Numbers Excerpt from Some Classes of Neutrosophic Graphs With Some Applications", ResearchGate 2022 (doi: 10.13140/RG.2.2.14971.39200).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0079   Dual-Dominating Numbers in Neutrosophic Setting and Crisp Setting Obtained From Classes of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Dual-Dominating Numbers in Neutrosophic Setting and Crisp Setting Obtained From Classes of Neutrosophic Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.19925.91361).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0078   Neutrosophic Path-Coloring Numbers BasedOn Endpoints In Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Neutrosophic Path-Coloring Numbers BasedOn Endpoints In Neutrosophic Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.27990.11845).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0077   Neutrosophic Dominating Path-Coloring Numbers in New Visions of Classes of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Neutrosophic Dominating Path-Coloring Numbers in New Visions of Classes of Neutrosophic Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.32151.65445).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0076   Path Coloring Numbers of Neutrosophic Graphs Based on Shared Edges and Neutrosophic Cardinality of Edges With Some Applications from Real-World Problems	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Path Coloring Numbers of Neutrosophic Graphs Based on Shared Edges and Neutrosophic Cardinality of Edges With Some Applications from Real-World Problems", ResearchGate 2022 (doi: 10.13140/RG.2.2.30105.70244).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0075   Neutrosophic Collapsed Numbers in the Viewpoint of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, "Neutrosophic Collapsed Numbers in the Viewpoint of Neutrosophic Graphs", ResearchGate 2022 (doi: 10.13140/RG.2.2.27962.67520).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	

2022	0074   Bulky Numbers of Classes of Neutrosophic Graphs Based on Neutrosophic Edges	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Bulky Numbers of Classes of Neutrosophic Graphs Based on Neutrosophic Edges”, ResearchGate 2022 (doi: 10.13140/RG.2.2.24204.18564).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0073   Dense Numbers and Minimal Dense Sets of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Dense Numbers and Minimal Dense Sets of Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.28044.59527).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0072   Connectivities of Neutrosophic Graphs in the terms of Crisp Cycles	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Connectivities of Neutrosophic Graphs in the terms of Crisp Cycles”, ResearchGate 2022 (doi: 10.13140/RG.2.2.31917.77281).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0071   Strong Paths Defining Connectivities in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Strong Paths Defining Connectivities in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.17311.43682).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0070   Finding Longest Weakest Paths assigning numbers to some Classes of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Finding Longest Weakest Paths assigning numbers to some Classes of Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.35579.59689).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0068   Relations and Notions amid Hamiltonicity and Eulerian Notions in Some Classes of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Relations and Notions amid Hamiltonicity and Eulerian Notions in Some Classes of Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.35579.59689).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0067   Eulerian Results In Neutrosophic Graphs With Applications	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Eulerian Results In Neutrosophic Graphs With Applications”, ResearchGate 2022 (doi: 10.13140/RG.2.2.34203.34089).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0066   Finding Hamiltonian Neutrosophic Cycles in Classes of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Finding Hamiltonian Neutrosophic Cycles in Classes of Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.29071.87200).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0065   Extending Sets Type-Results in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Extending Sets Type-Results in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.13317.01767).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0064   Some Polynomials Related to Numbers in Classes of (Strong) Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Some Polynomials Related to Numbers in Classes of (Strong) Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.36280.83204).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0063   Finding Shortest Sequences of Consecutive Vertices in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Finding Shortest Sequences of Consecutive Vertices in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.22924.59526).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	

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2022	0062   Neutrosophic Girth Based On Crisp Cycle in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Neutrosophic Girth Based On Crisp Cycle in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.14011.69923).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0061   e-Matching Number and e-Matching Polynomials in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “e-Matching Number and e-Matching Polynomials in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.32516.60805).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0060   Matching Polynomials in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Matching Polynomials in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.33630.72002).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0059   Some Results in Classes Of Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Some Results in Classes Of Neutrosophic Graphs”, Preprints 2022, 2022030248 (doi: 10.20944/preprints202203.0248.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0058   Matching Number in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Matching Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.18609.86882).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0055   (Failed) 1-clique Number in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “(Failed) 1-Clique Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.14241.89449).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0054   Failed Clique Number in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Failed Clique Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.36039.16800).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0053   Clique Number in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Clique Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.28338.68800).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0052   (Failed) 1-independent Number in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “(Failed) 1-Independent Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.30593.12643).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0051   Failed Independent Number in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Failed Independent Number in Neutrosophic Graphs”, Preprints 2022, 2022020334 (doi: 10.20944/preprints202202.0334.v2)</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2022	0051   Failed Independent Number in Neutrosophic Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Failed Independent Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.31196.05768).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	

2022	0050   Independent Set in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Independent Set in Neutrosophic Graphs”, Preprints 2022, 2022020334 (doi: 10.20944/preprints202202.0334.v1). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0050   Independent Set in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Independent Set in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.17472.81925). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0049   (Failed)1-Zero-Forcing Number in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “(Failed)1-Zero-Forcing Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.35241.26724). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0048   Failed Zero-Forcing Number in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Failed Zero-Forcing Number in Neutrosophic Graphs”, Preprints 2022, 2022020343 (doi: 10.20944/preprints202202.0343.v1). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0048   Failed Zero-Forcing Number in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Failed Zero-Forcing Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.24873.47209). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0047   Zero Forcing Number in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Zero Forcing Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.32265.93286). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0046   Quasi-Number in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Quasi-Number in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.18470.60488). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0045   Quasi-Degree in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Quasi-Degree in Neutrosophic Graphs”, Preprints 2022, 2022020100 (doi: 10.20944/preprints202202.0100.v1). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0045   Quasi-Degree in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Quasi-Degree in ResearchGate 2022 (doi: 10.13140/RG.2.2.25460.01927). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0044   Co-Neighborhood in Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Co-Neighborhood in Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.17687.44964). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2022	0043   Global Powerful Alliance in Strong Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Global Powerful Alliance in Strong Neutrosophic Graphs”, Preprints 2022, 2022010429 (doi: 10.20944/preprints202201.0429.v1). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	



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2022	0043   Global Powerful Alliance in Strong Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Global Powerful Alliance in Strong Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.31784.24322).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0042   Global Offensive Alliance in Strong Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Global Offensive Alliance in Strong Neutrosophic Graphs”, Preprints 2022, 2022010429 (doi: 10.20944/preprints202201.0429.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0042   Global Offensive Alliance in Strong Neutrosophic Graphs	Manuscript
	<p>» Henry Garrett, “Global Offensive Alliance in Strong Neutrosophic Graphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.26541.20961).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0041   Three Types of Neutrosophic Alliances based on Connectedness and (Strong) Edges	Manuscript
	<p>» Henry Garrett, “Three Types of Neutrosophic Alliances based on Connectedness and (Strong) Edges”, Preprints 2022, 2022010239 (doi: 10.20944/preprints202201.0239.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0041   Three Types of Neutrosophic Alliances based on Connectedness and (Strong) Edges	Manuscript
	<p>» Henry Garrett, “Three Types of Neutrosophic Alliances based on Connectedness and (Strong) Edges”, ResearchGate 2022 (doi: 10.13140/RG.2.2.18486.83521).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0040   Three types of neutrosophic alliances based of connectedness and (strong) edges (In-Progress)	Manuscript
	<p>» Henry Garrett, “Three types of neutrosophic alliances based of connectedness and (strong) edges (In-Progress)”, ResearchGate 2022 (doi: 10.13140/RG.2.2.27570.12480).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0039   Closing Numbers and Super-Closing Numbers as (Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-SuperHyperGraph	Manuscript
	<p>» Henry Garrett, “Closing Numbers and Super-Closing Numbers as (Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-SuperHyperGraph”, Preprints 2022, 2022010145 (doi: 10.20944/preprints202201.0145.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0039   Closing Numbers and Super-Closing Numbers as (Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-SuperHyperGraph	Manuscript
	<p>» Henry Garrett, “Closing Numbers and Super-Closing Numbers as (Dual)Resolving and (Dual)Coloring alongside (Dual)Dominating in (Neutrosophic)n-SuperHyperGraph”, ResearchGate 2022 (doi: 10.13140/RG.2.2.18909.54244/1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0038   Co-degree and Degree of classes of Neutrosophic Hypergraphs	Manuscript
	<p>» Henry Garrett, “Co-degree and Degree of classes of Neutrosophic Hypergraphs”, Preprints 2022, 2022010027 (doi: 10.20944/preprints202201.0027.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2022	0038   Co-degree and Degree of classes of Neutrosophic Hypergraphs	Manuscript
	<p>» Henry Garrett, “Co-degree and Degree of classes of Neutrosophic Hypergraphs”, ResearchGate 2022 (doi: 10.13140/RG.2.2.32672.10249).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0037   Dimension and Coloring alongside Domination in Neutrosophic Hypergraphs	Manuscript

	<p>» Henry Garrett, “Dimension and Coloring alongside Domination in Neutrosophic Hypergraphs”, Preprints 2021, 2021120448 (doi: 10.20944/preprints202112.0448.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0037   Dimension and Coloring alongside Domination in Neutrosophic Hypergraphs	Manuscript
	<p>» Henry Garrett, “Dimension and Coloring alongside Domination in Neutrosophic Hypergraphs”, ResearchGate 2021 (doi: 10.13140/RG.2.2.13070.28483).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0036   Different Types of Neutrosophic Chromatic Number	Manuscript
	<p>» Henry Garrett, “Different Types of Neutrosophic Chromatic Number”, Preprints 2021, 2021120335 (doi: 10.20944/preprints202112.0335.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0036   Different Types of Neutrosophic Chromatic Number	Manuscript
	<p>» Henry Garrett, “Different Types of Neutrosophic Chromatic Number”, ResearchGate 2021 (doi: 10.13140/RG.2.2.19068.46723).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0035   Neutrosophic Chromatic Number Based on Connectedness	Manuscript
	<p>» Henry Garrett, “Neutrosophic Chromatic Number Based on Connectedness”, Preprints 2021, 2021120226 (doi: 10.20944/preprints202112.0226.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0035   Neutrosophic Chromatic Number Based on Connectedness	Manuscript
	<p>» Henry Garrett, “Neutrosophic Chromatic Number Based on Connectedness”, ResearchGate 2021 (doi: 10.13140/RG.2.2.18563.84001).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0034   Chromatic Number and Neutrosophic Chromatic Number	Manuscript
	<p>» Henry Garrett, “Chromatic Number and Neutrosophic Chromatic Number”, Preprints 2021, 2021120177 (doi: 10.20944/preprints202112.0177.v1).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0034   Chromatic Number and Neutrosophic Chromatic Number	Manuscript
	<p>» Henry Garrett, “Chromatic Number and Neutrosophic Chromatic Number”, ResearchGate 2021 (doi: 10.13140/RG.2.2.36035.73766).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0033   Metric Dimension in fuzzy(neutrosophic) Graphs #12	Manuscript
	<p>» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs #12”, ResearchGate 2021 (doi: 10.13140/RG.2.2.20690.48322).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0032   Metric Dimension in fuzzy(neutrosophic) Graphs #11	Manuscript
	<p>» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs #11”, ResearchGate 2021 (doi: 10.13140/RG.2.2.29308.46725).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	
2021	0031   Metric Dimension in fuzzy(neutrosophic) Graphs #10	Manuscript
	<p>» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs #10”, ResearchGate 2021 (doi: 10.13140/RG.2.2.21614.54085).</p> <p>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</p>	

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2021	0030   Metric Dimension in fuzzy(neutrosophic) Graphs #9	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs #9”, ResearchGate 2021 (doi: 10.13140/RG.2.2.34040.16648). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0029   Metric Dimension in fuzzy(neutrosophic) Graphs #8	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs #8”, ResearchGate 2021 (doi: 10.13140/RG.2.2.19464.96007). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0028   Metric Dimension in fuzzy(neutrosophic) Graphs-VII	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs-VII”, ResearchGate 2021 (doi: 10.13140/RG.2.2.14667.72481). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0028   Metric Dimension in fuzzy(neutrosophic) Graphs-VII	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs-VII”, Preprints 2021, 2021110142 (doi: 10.20944/preprints202111.0142.v7). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0027   Metric Dimension in fuzzy(neutrosophic) Graphs-VI	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs-VI”, Preprints 2021, 2021110142 (doi: 10.20944/preprints202111.0142.v6). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0026   Metric Dimension in fuzzy(neutrosophic) Graphs-V	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs-V”, Preprints 2021, 2021110142 (doi: 10.20944/preprints202111.0142.v5). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0025   Metric Dimension in fuzzy(neutrosophic) Graphs-IV	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs-IV”, Preprints 2021, 2021110142 (doi: 10.20944/preprints202111.0142.v4). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0024   Metric Dimension in fuzzy(neutrosophic) Graphs-III	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs-III”, Preprints 2021, 2021110142 (doi: 10.20944/preprints202111.0142.v3). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0023   Metric Dimension in fuzzy(neutrosophic) Graphs-II	Manuscript
	» Henry Garrett, “Metric Dimension in fuzzy(neutrosophic) Graphs-II”, Preprints 2021, 2021110142 (doi: 10.20944/preprints202111.0142.v2). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0022   Metric Dimension in Fuzzy Graphs and Neutrosophic Graphs	Manuscript
	» Henry Garrett, “Metric Dimension in Fuzzy Graphs and Neutrosophic Graphs”, Preprints 2021, 2021110142 (doi: 10.20944/preprints202111.0142.v1) » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	
2021	0021   Valued Number And Set	Manuscript
	» Henry Garrett, “Valued Number And Set”, Preprints 2021, 2021080229 (doi: 10.20944/preprints202108.0229.v1). » Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn	

2021	0020   Notion of Valued Set	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Notion of Valued Set”, Preprints 2021, 2021070410 (doi: 10.20944/preprints202107.0410.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0019   Set And Its Operations	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Set And Its Operations”, Preprints 2021, 2021060508 (doi: 10.20944/preprints202106.0508.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0018   Metric Dimensions Of Graphs	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Metric Dimensions Of Graphs”, Preprints 2021, 2021060392 (doi: 10.20944/preprints202106.0392.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0017   New Graph Of Graph	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “New Graph Of Graph”, Preprints 2021, 2021060323 (doi: 10.20944/preprints202106.0323.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0016   Numbers Based On Edges	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Numbers Based On Edges”, Preprints 2021, 2021060315 (doi: 10.20944/preprints202106.0315.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0015   Locating And Location Number	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Locating And Location Number”, Preprints 2021, 2021060206 (doi: 10.20944/preprints202106.0206.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0014   Big Sets Of Vertices	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Big Sets Of Vertices”, Preprints 2021, 2021060189 (doi: 10.20944/preprints202106.0189.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0013   Matroid And Its Outlines	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Matroid And Its Outlines”, Preprints 2021, 2021060146 (doi: 10.20944/preprints202106.0146.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0012   Matroid And Its Relations	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Matroid And Its Relations”, Preprints 2021, 2021060080 (doi: 10.20944/preprints202106.0080.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	
2021	0011   Metric Number in Dimension	Manuscript
	<ul style="list-style-type: none"> <li>» Henry Garrett, “Metric Number in Dimension”, Preprints 2021, 2021060004 (doi: 10.20944/preprints202106.0004.v1).</li> <li>» Available at Twitter, ResearchGate, Scribd, Academia, Zenodo, LinkedIn</li> </ul>	

2023	0127   Space In SuperHyperGraphs	Amazon
<p>»</p> <p>@googlebooks:<a href="https://books.google.com/books/about?id=M56yEAAAQBAJ">https://books.google.com/books/about?id=M56yEAAAQBAJ</a>          @GooglePlay:<a href="https://play.google.com/store/books/details?id=M56yEAAAQBAJ">https://play.google.com/store/books/details?id=M56yEAAAQBAJ</a>          @ResearchGate: <a href="https://www.researchgate.net/publication/369088066">https://www.researchgate.net/publication/369088066</a>          @WordPress: <a href="https://drhenrygarrett.wordpress.com/2023/04/22/Space-In-SuperHyperGraphs/">https://drhenrygarrett.wordpress.com/2023/04/22/Space-In-SuperHyperGraphs/</a>          @Scribd: <a href="https://www.scribd.com/document/-">https://www.scribd.com/document/-</a>          @ZENODO<sub>RG</sub>: <a href="https://zenodo.org/record/7709116">https://zenodo.org/record/7709116</a>          @academia:<a href="https://www.academia.edu/98169374">https://www.academia.edu/98169374</a></p> <p>»</p> <p>(Paperback): <a href="https://www.amazon.com/dp/B0BW35YC1H">https://www.amazon.com/dp/B0BW35YC1H</a>          (Hardcover): <a href="https://www.amazon.com/dp/B0BW35YC1Z">https://www.amazon.com/dp/B0BW35YC1Z</a>          (Kindle Edition): <a href="https://www.amazon.com/dp/B0BWT68375">https://www.amazon.com/dp/B0BWT68375</a>          ISBN          (Paperback): 9798378898794          (Hardcover): 9798378899913          (Kindle Edition): CC BY-NC-ND 4.0</p>		
2023	0126   Edge-Connectivity In SuperHyperGraphs	Amazon
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2023	0125   Vertex-Connectivity In SuperHyperGraphs	Amazon
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 @academia: <https://www.academia.edu/91877217>  
 @ZENODO: <https://zenodo.org/record/7378758>  
 @WordPress: <https://drhenrygarrett.wordpress.com/2022/11/29/neut-superhyperedges-published-version/>

2023	-	Amazon
	<p>» Book 60   “Neut. SuperHyperEdges”</p> <p>»</p> <p>Link (Paperback): <a href="https://www.amazon.com/dp/B0BNH11ZDY">https://www.amazon.com/dp/B0BNH11ZDY</a> (Hardcover): <a href="https://www.amazon.com/dp/B0BNGZGPP6">https://www.amazon.com/dp/B0BNGZGPP6</a>            ISBN (Paperback): 9798365922365 (Hardcover): 9798365923980 (Kindle Edition): CC BY-NC-ND 4.0</p>	
2023	0069   SuperHyperMatching	Amazon
	<p>» ASIN : B0BSDPXX1P Publisher : Independently published (January 15, 2023) Language : English Paperback : 582 pages ISBN-13 : 979-8373872683 Item Weight : 3.6 pounds Dimensions : 8.5 x 1.37 x 11 inches</p> <p>» ASIN : B0BSDC1L66 Publisher : Independently published (January 16, 2023) Language : English Hardcover : 548 pages ISBN-13 : 979-8373875424 Item Weight : 3.3 pounds Dimensions : 8.25 x 1.48 x 11 inches</p>	
2023	0068   Failed SuperHyperClique	Amazon
	<p>» ASIN : B0BRZ67NYN Publisher : Independently published (January 10, 2023) Language : English Paperback : 454 pages ISBN-13 : 979-8373274227 Item Weight : 2.83 pounds Dimensions : 8.5 x 1.07 x 11 inches</p> <p>» ASIN : B0BRYZTK24 Publisher : Independently published (January 10, 2023) Language : English Hardcover : 460 pages ISBN-13 : 979-8373277273 Item Weight : 2.78 pounds Dimensions : 8.25 x 1.27 x 11 inches</p>	
2023	0067   SuperHyperClique	Amazon
	<p>» ASIN : B0BRWK4S1Y Publisher : Independently published (January 8, 2023) Language : English Paperback : 376 pages ISBN-13 : 979-8373040471 Item Weight : 2.36 pounds Dimensions : 8.5 x 0.89 x 11 inches</p> <p>» ASIN : B0BRM24YJX Publisher : Independently published (January 8, 2023) Language : English Hardcover : 388 pages ISBN-13 : 979-8373041935 Item Weight : 2.36 pounds Dimensions : 8.25 x 1.1 x 11 inches</p>	
2023	0066   Failed SuperHyperStable	Amazon
	<p>» ASIN : B0BRNG7DC8 Publisher : Independently published (January 4, 2023) Language : English Paperback : 304 pages ISBN-13 : 979-8372597976 Item Weight : 1.93 pounds Dimensions : 8.5 x 0.72 x 11 inches</p> <p>» ASIN : B0BRLVN39L Publisher : Independently published (January 4, 2023) Language : English Hardcover : 306 pages ISBN-13 : 979-8372599765 Item Weight : 1.89 pounds Dimensions : 8.25 x 0.91 x 11 inches</p>	
2023	0065   SuperHyperStable	Amazon
	<p>» ASIN : B0BRDG5Z4Y Publisher : Independently published (January 2, 2023) Language : English Paperback : 294 pages ISBN-13 : 979-8372248519 Item Weight : 1.93 pounds Dimensions : 8.27 x 0.7 x 11.69 inches</p> <p>» ASIN : B0BRJPG56M Publisher : Independently published (January 2, 2023) Language : English Hardcover : 290 pages ISBN-13 : 979-8372252011 Item Weight : 1.79 pounds Dimensions : 8.25 x 0.87 x 11 inches</p>	

2023	0064   Failed SuperHyperForcing	<a href="#">Amazon</a>
	<p>» ASIN : B0BRH5B4QM Publisher : Independently published (January 1, 2023) Language : English Paperback : 337 pages ISBN-13 : 979-8372123649 Item Weight : 2.13 pounds Dimensions : 8.5 x 0.8 x 11 inches</p> <p>» ASIN : B0BRGX4DBJ Publisher : Independently published (January 1, 2023) Language : English Hardcover : 337 pages ISBN-13 : 979-8372124509 Item Weight : 2.07 pounds Dimensions : 8.25 x 0.98 x 11 inches</p>	
2022	0063   SuperHyperForcing	<a href="#">Amazon</a>
	<p>» ASIN : B0BRDG1KN1 Publisher : Independently published (December 30, 2022) Language : English Paperback : 285 pages ISBN-13 : 979-8371873347 Item Weight : 1.82 pounds Dimensions : 8.5 x 0.67 x 11 inches</p> <p>» ASIN : B0BRDFFQMF Publisher : Independently published (December 30, 2022) Language : English Hardcover : 285 pages ISBN-13 : 979-8371874092 Item Weight : 1.77 pounds Dimensions : 8.25 x 0.86 x 11 inches</p>	
2022	0062   SuperHyperAlliances	<a href="#">Amazon</a>
	<p>» ASIN : B0BR6YC3HG Publisher : Independently published (December 27, 2022) Language : English Paperback : 189 pages ISBN-13 : 979-8371488343 Item Weight : 1.24 pounds Dimensions : 8.5 x 0.45 x 11 inches</p> <p>» ASIN : B0BR7CBTC6 Publisher : Independently published (December 27, 2022) Language : English Hardcover : 189 pages ISBN-13 : 979-8371494849 Item Weight : 1.21 pounds Dimensions : 8.25 x 0.64 x 11 inches</p>	
2022	0061   SuperHyperGraphs	<a href="#">Amazon</a>
	<p>» ASIN : B0BR1NHY4Z Publisher : Independently published (December 24, 2022) Language : English Paperback : 117 pages ISBN-13 : 979-8371090133 Item Weight : 13 ounces Dimensions : 8.5 x 0.28 x 11 inches</p> <p>» ASIN : B0BQXTHTXY Publisher : Independently published (December 24, 2022) Language : English Hardcover : 117 pages ISBN-13 : 979-8371093240 Item Weight : 12.6 ounces Dimensions : 8.25 x 0.47 x 11 inches</p>	
2022	0060   Neut. SuperHyperEdges	<a href="#">Amazon</a>
	<p>» ASIN : B0BNH11ZDY Publisher : Independently published (November 27, 2022) Language : English Paperback : 107 pages ISBN-13 : 979-8365922365 Item Weight : 12 ounces Dimensions : 8.5 x 0.26 x 11 inches</p> <p>» ASIN : B0BNGZGPP6 Publisher : Independently published (November 27, 2022) Language : English Hardcover : 107 pages ISBN-13 : 979-8365923980 Item Weight : 11.7 ounces Dimensions : 8.25 x 0.45 x 11 inches</p>	
2022	0059   Neutrosophic k-Number	<a href="#">Amazon</a>
	<p>» ASIN : B0BF3P5X4N Publisher : Independently published (September 14, 2022) Language : English Paperback : 159 pages ISBN-13 : 979-8352590843 Item Weight : 1.06 pounds Dimensions : 8.5 x 0.38 x 11 inches</p> <p>» ASIN : B0BF2XCDZM Publisher : Independently published (September 14, 2022) Language : English Hardcover : 159 pages ISBN-13 : 979-8352593394 Item Weight : 1.04 pounds Dimensions : 8.25 x 0.57 x 11 inches</p>	
2022	0058   Neutrosophic Schedule	<a href="#">Amazon</a>
	<p>» ASIN : B0BBJWJJZF Publisher : Independently published (August 22, 2022) Language : English Paperback : 493 pages ISBN-13 : 979-8847885256 Item Weight : 3.07 pounds Dimensions : 8.5 x 1.16 x 11 inches</p> <p>» ASIN : B0BBJLPWKH Publisher : Independently published (August 22, 2022) Language : English Hardcover : 493 pages ISBN-13 : 979-8847886055 Item Weight : 2.98 pounds Dimensions : 8.25 x 1.35 x 11 inches</p>	
2022	0057   Neutrosophic Wheel	<a href="#">Amazon</a>



		<p>» ASIN : B0BBJRHXG Publisher : Independently published (August 22, 2022) Language : English Paperback : 195 pages ISBN-13 : 979-8847865944 Item Weight : 1.28 pounds Dimensions : 8.5 x 0.46 x 11 inches</p> <p>» ASIN : B0BBK3KG82 Publisher : Independently published (August 22, 2022) Language : English Hardcover : 195 pages ISBN-13 : 979-8847867016 Item Weight : 1.25 pounds Dimensions : 8.25 x 0.65 x 11 inches</p>	
2022	0056   Neutrosophic t-partite		<a href="#">Amazon</a>
		<p>» ASIN : B0BBJLZCHS Publisher : Independently published (August 22, 2022) Language : English Paperback : 235 pages ISBN-13 : 979-8847834957 Item Weight : 1.52 pounds Dimensions : 8.5 x 0.56 x 11 inches</p> <p>» ASIN : B0BBJDFGJS Publisher : Independently published (August 22, 2022) Language : English Hardcover : 235 pages ISBN-13 : 979-8847838337 Item Weight : 1.48 pounds Dimensions : 8.25 x 0.75 x 11 inches</p>	
2022	0055   Neutrosophic Bipartite		<a href="#">Amazon</a>
		<p>» ASIN : B0BB5Z9GHW Publisher : Independently published (August 22, 2022) Language : English Paperback : 225 pages ISBN-13 : 979-8847820660 Item Weight : 1.46 pounds Dimensions : 8.5 x 0.53 x 11 inches</p> <p>» ASIN : B0BBGG9RDZ Publisher : Independently published (August 22, 2022) Language : English Hardcover : 225 pages ISBN-13 : 979-8847821667 Item Weight : 1.42 pounds Dimensions : 8.25 x 0.72 x 11 inches</p>	
2022	0054   Neutrosophic Star		<a href="#">Amazon</a>
		<p>» ASIN : B0BB5ZHSSZ Publisher : Independently published (August 22, 2022) Language : English Paperback : 215 pages ISBN-13 : 979-8847794374 Item Weight : 1.4 pounds Dimensions : 8.5 x 0.51 x 11 inches</p> <p>» ASIN : B0BBC4BL9P Publisher : Independently published (August 22, 2022) Language : English Hardcover : 215 pages ISBN-13 : 979-8847796941 Item Weight : 1.36 pounds Dimensions : 8.25 x 0.7 x 11 inches</p>	
2022	0053   Neutrosophic Cycle		<a href="#">Amazon</a>
		<p>» ASIN : B0BB62NZQK Publisher : Independently published (August 22, 2022) Language : English Paperback : 343 pages ISBN-13 : 979-8847780834 Item Weight : 2.17 pounds Dimensions : 8.5 x 0.81 x 11 inches</p> <p>» ASIN : B0BB65QMKQ Publisher : Independently published (August 22, 2022) Language : English Hardcover : 343 pages ISBN-13 : 979-8847782715 Item Weight : 2.11 pounds Dimensions : 8.25 x 1 x 11 inches</p>	
2022	0052   Neutrosophic Path		<a href="#">Amazon</a>
		<p>» ASIN : B0BB67WCXL Publisher : Independently published (August 8, 2022) Language : English Paperback : 315 pages ISBN-13 : 979-8847730570 Item Weight : 2 pounds Dimensions : 8.5 x 0.74 x 11 inches</p> <p>» ASIN : B0BB5Z9FXL Publisher : Independently published (August 8, 2022) Language : English Hardcover : 315 pages ISBN-13 : 979-8847731263 Item Weight : 1.95 pounds Dimensions : 8.25 x 0.93 x 11 inches</p>	
2022	0051   Neutrosophic Complete		<a href="#">Amazon</a>
		<p>» ASIN : B0BB6191KN Publisher : Independently published (August 8, 2022) Language : English Paperback : 227 pages ISBN-13 : 979-8847720878 Item Weight : 1.47 pounds Dimensions : 8.5 x 0.54 x 11 inches</p> <p>» ASIN : B0BB5RRQN7 Publisher : Independently published (August 8, 2022) Language : English Hardcover : 227 pages ISBN-13 : 979-8847721844 Item Weight : 1.43 pounds Dimensions : 8.25 x 0.73 x 11 inches</p>	
2022	0050   Neutrosophic Dominating		<a href="#">Amazon</a>

		<p>» ASIN : B0BB5QV8WT Publisher : Independently published (August 8, 2022) Language : English Paperback : 357 pages ISBN-13 : 979-8847592000 Item Weight : 2.25 pounds Dimensions : 8.5 x 0.84 x 11 inches</p> <p>» ASIN : B0BB61WL9M Publisher : Independently published (August 8, 2022) Language : English Hardcover : 357 pages ISBN-13 : 979-8847593755 Item Weight : 2.19 pounds Dimensions : 8.25 x 1.03 x 11 inches</p>	
2022	0049	Neutrosophic Resolving	<a href="#">Amazon</a>
		<p>» ASIN : B0BBCJMRH8 Publisher : Independently published (August 8, 2022) Language : English Paperback : 367 pages ISBN-13 : 979-8847587891 Item Weight : 2.31 pounds Dimensions : 8.5 x 0.87 x 11 inches</p> <p>» ASIN : B0BBCB6DFC Publisher : Independently published (August 8, 2022) Language : English Hardcover : 367 pages ISBN-13 : 979-8847589987 Item Weight : 2.25 pounds Dimensions : 8.25 x 1.06 x 11 inches</p>	
2022	0048	Neutrosophic Stable	<a href="#">Amazon</a>
		<p>» ASIN : B0B7QGTFNW Publisher : Independently published (July 28, 2022) Language : English Paperback : 133 pages ISBN-13 : 979-8842880348 Item Weight : 14.6 ounces Dimensions : 8.5 x 0.32 x 11 inches</p> <p>» ASIN : B0B7QJWQ35 Publisher : Independently published (July 28, 2022) Language : English Hardcover : 133 pages ISBN-13 : 979-8842881659 Item Weight : 14.2 ounces Dimensions : 8.25 x 0.51 x 11 inches</p>	
2022	0047	Neutrosophic Total	<a href="#">Amazon</a>
		<p>» ASIN : B0B7GLB23F Publisher : Independently published (July 25, 2022) Language : English Paperback : 137 pages ISBN-13 : 979-8842357741 Item Weight : 14.9 ounces Dimensions : 8.5 x 0.33 x 11 inches</p> <p>» ASIN : B0B6XVTDYC Publisher : Independently published (July 25, 2022) Language : English Hardcover : 137 pages ISBN-13 : 979-8842358915 Item Weight : 14.6 ounces Dimensions : 8.25 x 0.52 x 11 inches</p>	
2022	0046	Neutrosophic Perfect	<a href="#">Amazon</a>
		<p>» ASIN : B0B7CJHCYZ Publisher : Independently published (July 22, 2022) Language : English Paperback : 127 pages ISBN-13 : 979-8842027330 Item Weight : 13.9 ounces Dimensions : 8.5 x 0.3 x 11 inches</p> <p>» ASIN : B0B7C732Z1 Publisher : Independently published (July 22, 2022) Language : English Hardcover : 127 pages ISBN-13 : 979-8842028757 Item Weight : 13.6 ounces Dimensions : 8.25 x 0.49 x 11 inches</p>	
2022	0045	Neutrosophic Joint Set	<a href="#">Amazon</a>
		<p>» ASIN : B0B6L8WJ77 Publisher : Independently published (July 15, 2022) Language : English Paperback : 139 pages ISBN-13 : 979-8840802199 Item Weight : 15 ounces Dimensions : 8.5 x 0.33 x 11 inches</p> <p>» ASIN : B0B6L9GJWR Publisher : Independently published (July 15, 2022) Language : English Hardcover : 139 pages ISBN-13 : 979-8840803295 Item Weight : 14.7 ounces Dimensions : 8.25 x 0.52 x 11 inches</p>	
August 2022	30, 0044	Neutrosophic Duality	<p>GLOBAL KNOWLEDGE - Publishing House&amp;Amazon&amp;Google Scholar&amp;UNM</p>

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- » Neutrosophic Duality, GLOBAL KNOWLEDGE - Publishing House:  
GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131  
United States. ISBN: 978-1-59973-743-0  
Henry Garrett, (2022). "Neutrosophic Duality", Florida: GLOBAL KNOWLEDGE - Publishing  
House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. ISBN: 978-1-59973-743-0  
(<http://fs.unm.edu/NeutrosophicDuality.pdf>).
- » ASIN : B0B4SJ8Y44 Publisher : Independently published (June 22, 2022) Language : English  
Paperback : 115 pages ISBN-13 : 979-8837647598 Item Weight : 12.8 ounces Dimensions : 8.5  
x 0.27 x 11 inches  
ASIN : B0B46B4CXT Publisher : Independently published (June 22, 2022) Language : English  
Hardcover : 115 pages ISBN-13 : 979-8837649981 Item Weight : 12.5 ounces Dimensions : 8.25  
x 0.46 x 11 inches

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Google Scholar: <https://books.google.com/books?id=dWWkEAAAQBAJ>

Paperback: <https://www.amazon.com/dp/B0B4SJ8Y44>

Hardcover: <https://www.amazon.com/dp/B0B46B4CXT>

2022	0043   Neutrosophic Path-Coloring	Amazon
	» ASIN : B0B3F2BZC4 Publisher : Independently published (June 7, 2022) Language : English Paperback : 161 pages ISBN-13 : 979-8834894469 Item Weight : 1.08 pounds Dimensions : 8.5 x 0.38 x 11 inches » ASIN : B0B3FGPGQ3 Publisher : Independently published (June 7, 2022) Language : English Hardcover : 161 pages ISBN-13 : 979-8834895954 Item Weight : 1.05 pounds Dimensions : 8.25 x 0.57 x 11 inches	
2022	0042   Neutrosophic Density	Amazon
	» ASIN : B0B19CDX7W Publisher : Independently published (May 15, 2022) Language : English Paperback : 145 pages ISBN-13 : 979-8827498285 Item Weight : 15.7 ounces Dimensions : 8.5 x 0.35 x 11 inches » ASIN : B0B14PLPGL Publisher : Independently published (May 15, 2022) Language : English Hardcover : 145 pages ISBN-13 : 979-8827502944 Item Weight : 15.4 ounces Dimensions : 8.25 x 0.53 x 11 inches	
2022	0041   Properties of SuperHyperGraph and Neutrosophic SuperHyperGraph	Google Commerce Ltd
	» Publisher Infinite Study Seller Google Commerce Ltd Published on Apr 27, 2022 Pages 30 Features Original pages Best for web, tablet, phone, eReader Language English Genres Antiques & Collectibles / Reference Content protection This content is DRM free GooglePlay » Properties of SuperHyperGraph and Neutrosophic SuperHyperGraph Front Cover Henry Garrett Infinite Study, 27 Apr 2022 - Antiques & Collectibles - 30 pages GoogleBooks Henry Garrett, "Properties of SuperHyperGraph and Neutrosophic SuperHyperGraph", Neutrosophic Sets and Systems 49 (2022) 531-561 (doi: 893 10.5281/zenodo.6456413). ( <a href="http://fs.unm.edu/NSS/NeutrosophicSuperHyperGraph34.pdf">http://fs.unm.edu/NSS/NeutrosophicSuperHyperGraph34.pdf</a> ).	
2022	0040   Neutrosophic Connectivity	Amazon
	» ASIN : B09YQJG2ZV Publisher : Independently published (April 26, 2022) Language : English Paperback : 121 pages ISBN-13 : 979-8811310968 Item Weight : 13.4 ounces Dimensions : 8.5 x 0.29 x 11 inches » ASIN : B09YQJG2DZ Publisher : Independently published (April 26, 2022) Language : English Hardcover : 121 pages ISBN-13 : 979-8811316304 Item Weight : 13.1 ounces Dimensions : 8.25 x 0.48 x 11 inches	
2022	0039   Neutrosophic Cycles	Amazon
	» ASIN : B09X4KVLQG Publisher : Independently published (April 8, 2022) Language : English Paperback : 169 pages ISBN-13 : 979-8449137098 Item Weight : 1.12 pounds Dimensions : 8.5 x 0.4 x 11 inches » ASIN : B09X4LZ3HL Publisher : Independently published (April 8, 2022) Language : English Hardcover : 169 pages ISBN-13 : 979-8449144157 Item Weight : 1.09 pounds Dimensions : 8.25 x 0.59 x 11 inches	

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2022	0038   Girth in Neutrosophic Graphs	<a href="#">Amazon</a>
	<p>» ASIN : B09WQ5PFV8 Publisher : Independently published (March 29, 2022) Language : English Paperback : 163 pages ISBN-13 : 979-8442380538 Item Weight : 1.09 pounds Dimensions : 8.5 x 0.39 x 11 inches</p> <p>» ASIN : B09WQQGXPZ Publisher : Independently published (March 29, 2022) Language : English Hardcover : 163 pages ISBN-13 : 979-8442386592 Item Weight : 1.06 pounds Dimensions : 8.25 x 0.58 x 11 inches</p>	
2022	0037   Matching Number in Neutrosophic Graphs	<a href="#">Amazon</a>
	<p>» ASIN : B09W7FT8GM Publisher : Independently published (March 22, 2022) Language : English Paperback : 153 pages ISBN-13 : 979-8437529676 Item Weight : 1.03 pounds Dimensions : 8.5 x 0.36 x 11 inches</p> <p>» ASIN : B09W4HF99L Publisher : Independently published (March 22, 2022) Language : English Hardcover : 153 pages ISBN-13 : 979-8437539057 Item Weight : 1 pounds Dimensions : 8.25 x 0.55 x 11 inches</p>	
2022	0036   Clique Number in Neutrosophic Graph	<a href="#">Amazon</a>
	<p>» ASIN : B09TV82Q7T Publisher : Independently published (March 7, 2022) Language : English Paperback : 155 pages ISBN-13 : 979-8428585957 Item Weight : 1.04 pounds Dimensions : 8.5 x 0.37 x 11 inches</p> <p>» ASIN : B09TZBPWJG Publisher : Independently published (March 7, 2022) Language : English Hardcover : 155 pages ISBN-13 : 979-8428590258 Item Weight : 1.01 pounds Dimensions : 8.25 x 0.56 x 11 inches</p>	
2022	0035   Independence in Neutrosophic Graphs	<a href="#">Amazon</a>
	<p>» ASIN : B09TF227GG Publisher : Independently published (February 27, 2022) Language : English Paperback : 149 pages ISBN-13 : 979-8424231681 Item Weight : 1 pounds Dimensions : 8.5 x 0.35 x 11 inches</p> <p>» ASIN : B09TL1LSKD Publisher : Independently published (February 27, 2022) Language : English Hardcover : 149 pages ISBN-13 : 979-8424234187 Item Weight : 15.7 ounces Dimensions : 8.25 x 0.54 x 11 inches</p>	
2022	0034   Zero Forcing Number in Neutrosophic Graphs	<a href="#">Amazon</a>
	<p>» ASIN : B09SW2YVKB Publisher : Independently published (February 18, 2022) Language : English Paperback : 147 pages ISBN-13 : 979-8419302082 Item Weight : 15.8 ounces Dimensions : 8.5 x 0.35 x 11 inches</p> <p>» ASIN : B09SWLK7BG Publisher : Independently published (February 18, 2022) Language : English Hardcover : 147 pages ISBN-13 : 979-8419313651 Item Weight : 15.5 ounces Dimensions : 8.25 x 0.54 x 11 inches</p>	
2022	0033   Neutrosophic Quasi-Order	<a href="#">Amazon</a>
	<p>» ASIN : B09S3RXQ5C Publisher : Independently published (February 8, 2022) Language : English Paperback : 107 pages ISBN-13 : 979-8414541165 Item Weight : 12 ounces Dimensions : 8.5 x 0.26 x 11 inches</p> <p>» ASIN : B09S232DQH Publisher : Independently published (February 8, 2022) Language : English Hardcover : 107 pages ISBN-13 : 979-8414545446 Item Weight : 11.7 ounces Dimensions : 8.25 x 0.43 x 11 inches</p>	
Jan 29, 2022	0032   Beyond Neutrosophic Graphs	<a href="#">E-publishing&amp;Amazon&amp;Google Scholar&amp;UNM</a>

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» Beyond Neutrosophic Graphs, E-publishing:  
Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United States  
ISBN 978-1-59973-725-6  
Henry Garrett, (2022). "Beyond Neutrosophic Graphs", Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United States. ISBN: 978-1-59973-725-6 (<http://fs.unm.edu/BeyondNeutrosophicGraphs.pdf>).  
» ASIN : B0BBCQJQG5 Publisher : Independently published (August 8, 2022) Language : English Paperback : 257 pages ISBN-13 : 979-8847564885 Item Weight : 1.65 pounds Dimensions : 8.5 x 0.61 x 11 inches  
ASIN : B0BBC4BJZ5 Publisher : Independently published (August 8, 2022) Language : English Hardcover : 257 pages ISBN-13 : 979-8847567497 Item Weight : 1.61 pounds Dimensions : 8.25 x 0.8 x 11 inches  
E-publishing: Educational Publisher: <http://fs.unm.edu/BeyondNeutrosophicGraphs.pdf>  
UNM: <http://fs.unm.edu/BeyondNeutrosophicGraphs.pdf>  
Google Scholar: <https://books.google.com/books?id=cWWkEAAAQBAJ>  
Paperback: <https://www.amazon.com/gp/product/B0BBCQJQG5>  
Hardcover: <https://www.amazon.com/Beyond-Neutrosophic-Graphs-Henry-Garrett/dp/B0BBC4BJZ5>

2022	0031   Neutrosophic Alliances	<a href="#">Amazon</a>
	» ASIN : B09RB5XLVB Publisher : Independently published (January 26, 2022) Language : English Paperback : 87 pages ISBN-13 : 979-8408627646 Item Weight : 10.1 ounces Dimensions : 8.5 x 0.21 x 11 inches » ASIN : B09R39MTSW Publisher : Independently published (January 26, 2022) Language : English Hardcover : 87 pages ISBN-13 : 979-8408632459 Item Weight : 9.9 ounces Dimensions : 8.25 x 0.4 x 11 inches	
2022	0030   Neutrosophic Hypergraphs	<a href="#">Amazon</a>
	» ASIN : B09PMBKVD4 Publisher : Independently published (January 7, 2022) Language : English Paperback : 79 pages ISBN-13 : 979-8797327974 Item Weight : 9.3 ounces Dimensions : 8.5 x 0.19 x 11 inches » ASIN : B09PP8VZ3D Publisher : Independently published (January 7, 2022) Language : English Hardcover : 79 pages ISBN-13 : 979-8797331483 Item Weight : 9.1 ounces Dimensions : 8.25 x 0.38 x 11 inches	
2022	0029   Collections of Articles	<a href="#">Amazon</a>
	» - » ASIN : B09PHHDDQK Publisher : Independently published (January 2, 2022) Language : English Hardcover : 543 pages ISBN-13 : 979-8794267204 Item Weight : 3.27 pounds Dimensions : 8.25 x 1.47 x 11 inches	
2022	0028   Collections of Math	<a href="#">Amazon</a>
	» - » ASIN : B09PHBWT5D Publisher : Independently published (January 1, 2022) Language : English Hardcover : 461 pages ISBN-13 : 979-8793793339 Item Weight : 2.8 pounds Dimensions : 8.25 x 1.28 x 11 inches	
2022	0027   Collections of US	<a href="#">Amazon</a>
	» - » ASIN : B09PHBT924 Publisher : Independently published (December 31, 2021) Language : English Hardcover : 261 pages ISBN-13 : 979-8793629645 Item Weight : 1.63 pounds Dimensions : 8.25 x 0.81 x 11 inches	
2021	0026   Neutrosophic Chromatic Number	<a href="#">Amazon</a>

	<p>» ASIN : B09NRD25MG Publisher : Independently published (December 20, 2021) Language : English Paperback : 67 pages ISBN-13 : 979-8787858174 Item Weight : 8.2 ounces Dimensions : 8.5 x 0.16 x 11 inches Language : English</p> <p>» -</p>	
2021	0025   Simple Ideas	<a href="#">Amazon</a>
	<p>» ASIN : B09MYTN6NT Publisher : Independently published (December 9, 2021) Language : English Paperback : 45 pages ISBN-13 : 979-8782049430 Item Weight : 6.1 ounces Dimensions : 8.5 x 0.11 x 11 inches</p> <p>» -</p>	
2021	0024   Neutrosophic Graphs	<a href="#">Amazon</a>
	<p>» ASIN : B09MYXVNF9 Publisher : Independently published (December 7, 2021) Language : English Paperback : 55 pages ISBN-13 : 979-8780775652 Item Weight : 7 ounces Dimensions : 8.5 x 0.13 x 11 inches</p> <p>» -</p>	
2021	0023   List	<a href="#">Amazon</a>
	<p>» ASIN : B09M554XCL Publisher : Independently published (November 20, 2021) Language : English Paperback : 49 pages ISBN-13 : 979-8770762747 Item Weight : 6.4 ounces Dimensions : 8.5 x 0.12 x 11 inches</p> <p>» -</p>	
2021	0022   Theorems	<a href="#">Amazon</a>
	<p>» ASIN : B09KDZXGPR Publisher : Independently published (October 28, 2021) Language : English Paperback : 51 pages ISBN-13 : 979-8755453592 Item Weight : 6.7 ounces Dimensions : 8.5 x 0.12 x 11 inches</p> <p>» -</p>	
2021	0021   Dimension	<a href="#">Amazon</a>
	<p>» ASIN : B09K2BBQG7 Publisher : Independently published (October 25, 2021) Language : English Paperback : 55 pages ISBN-13 : 979-8753577146 Item Weight : 7 ounces Dimensions : 8.5 x 0.13 x 11 inches</p> <p>» -</p>	
2021	0020   Beyond The Graph Theory	<a href="#">Amazon</a>
	<p>» ASIN : B09KDZXGPR Publisher : Independently published (October 28, 2021) Language : English Paperback : 51 pages ISBN-13 : 979-8755453592 Item Weight : 6.7 ounces Dimensions : 8.5 x 0.12 x 11 inches</p> <p>» -</p>	
2021	0019   Located Heart And Memories	<a href="#">Amazon</a>
	<p>» ASIN : B09F14PL8T Publisher : Independently published (August 31, 2021) Language : English Paperback : 56 pages ISBN-13 : 979-8468253816 Item Weight : 7 ounces Dimensions : 8.5 x 0.14 x 11 inches</p> <p>» -</p>	
2021	0018   Number Graphs And Numbers	<a href="#">Amazon</a>
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2021	0015   Definition And Its Necessities	<a href="#">Amazon</a>
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2021	0011   Domination Theory And Beyond	<a href="#">Amazon</a>
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2021	0010   Vital Glory	<a href="#">Amazon</a>
	<p>» ASIN : B08PVNJYRM Publication date : December 6, 2020 Language : English File size : 1544 KB Simultaneous device usage : Unlimited Text-to-Speech : Enabled Screen Reader : Supported Enhanced typesetting : Enabled X-Ray : Not Enabled Word Wise : Enabled Print length : 24 pages Lending : Enabled Kindle</p> <p>» -</p>	
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» **Análisis de modelos y orientación más allá Planteamiento y problemas en dos modelos** Ediciones Nuestro Conocimiento (2021-04-06) eligible for voucher ISBN-13: 978-620-3-59902-2 ISBN-10: 6203599026 EAN: 9786203599022 Book language: Blurb/Shorttext: El enfoque para la resolución de problemas es una selección obvia para hacer la investigación y el análisis de la situación que puede provocar las perspectivas vagas que queremos no ser para extraer ideas creativas y nuevas que queremos ser. Estudio simultáneamente dos modelos. Este estudio se basa tanto en la investigación como en la discusión que el autor piensa que puede ser útil para entender y hacer crecer nuestra fantasía y la realidad juntas. Publishing house: Ediciones Nuestro Conocimiento Website: <https://sciencia-scripts.com> By (author) : Henry Garrett Number of pages: 64 Published on: 2021-04-06 Stock: Available Category: Mathematics Price: 39.90 Keywords: Dos modelos, optimización de rutas y transporte, Two Models, Optimizing Routes and Transportation

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<https://www.morebooks.shop/store/gb/book/análisis-de-modelos-y-orientación-más-allá/isbn/978-620-3-59902-2>

» **Product details** Publisher : Ediciones Nuestro Conocimiento (6 April 2021) Language : Spanish ISBN-10 : 6203599026 ISBN-13 : 978-6203599022 Dimensions : 15 x 0.4 x 22 cm

Paperback:

<https://www.amazon.co.uk/Análisis-modelos-orientación-allá-Planteamiento/dp/6203599026>

2021

0008 | Анализ моделей и руководство за пределами

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0007 | Análise e Orientação de Modelos Além

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0006 | Analizy modelowe i wytyczne wykraczające poza

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0005 | Modelanalyses en begeleiding daarna

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» Modelanalyses en begeleiding daarna Aanpak en problemen in twee modellen Uitgeverij Onze Kennis (2021-04-06 ) eligible for voucher ISBN-13: 978-620-3-59905-3 ISBN-10:6203599050EAN:9786203599053Book language:Blurb/Shorttext:De aanpak voor het oplossen van problemen is een voor de hand liggende keuze voor het doen van onderzoek en het analyseren van de situatie die de vage perspectieven kan oproepen die we niet willen zijn voor het extraheren van creatieve en nieuwe ideeën die we willen zijn. Ik bestudeer tegelijkertijd twee modellen. Deze studie is gebaseerd op zowel onderzoek als discussie waarvan de auteur denkt dat ze nuttig kunnen zijn voor het begrijpen en laten groeien van onze fantasieën en de werkelijkheid samen.Publishing house: Uitgeverij Onze Kennis Website: <https://sciencia-scripts.com> By (author) : Henry Garrett Number of pages:64Published on:2021-04-06Stock:Available Category: Mathematics Price:39.90 Keywords:Twee modellen, optimalisering van routes en transport, Two Models, Optimizing Routes and Transportation MoreBooks

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0004 | Analisi dei modelli e guida oltre

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0003 | Analyses de modèles et orientations au-delà

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0002 | Modell-Analysen und Anleitungen darüber hinaus

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### Participating in Seminars

I've participated in all virtual conferences which are listed below [Some of them without selective process].

–<https://web.math.princeton.edu/pds/onlinetalks/talks.html>

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Also, I've participated in following events [Some of them without selective process]:

–The Hidden NORMS seminar

–Talk Math With Your Friends (TMWYF)

–MATHEMATICS COLLOQUIUM: <https://www.csulb.edu/mathematics-statistics/mathematics-colloquium>

–Lathisms: Cafe Con Leche

–Big Math network

...

I'm in mailing list in following [Some of them without selective process] organizations:

–[Algebraic-graph-theory] AGT Seminar ([lists-uwaterloo-ca](https://lists.uwaterloo.ca))

–Combinatorics Lectures Online (<https://web.math.princeton.edu/pds/onlinetalks/talks.html>)

–Women in Combinatorics

–CMSA-Seminar ([unsw-au](https://www.unsw.edu.au))

–OURFA2M2 Online Undergraduate Resource Fair for the Advancement and Alliance of Marginalized Mathematicians

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### ☰ Social Accounts

I've listed my accounts below.

-My website [Covering all my contributions containing articles and books as free access to download with PDF extension and more]: <https://drhenrygarrett.wordpress.com>

-Amazon [Some of my all books, here]: <https://www.amzn.com/author/drhenrygarrett>

-Twitter: @DrHenryGarrett ([www.twitter.com/DrHenryGarrett](http://www.twitter.com/DrHenryGarrett))

- ResearchGate: <https://www.researchgate.net/profile/Henry-Garrett-2>

-Academia: <https://independent.academia.edu/drhenrygarrett/>

-Scribd: <https://www.scribd.com/user/596815491/Henry-Garrett>

-Scholar: [https://scholar.google.com/citations?hl=enuser=SUjFCmcAAAAJview\\_op=list\\_workssortby=pubdate](https://scholar.google.com/citations?hl=enuser=SUjFCmcAAAAJview_op=list_workssortby=pubdate)

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### »»» References

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In this scientific research book, there are some scientific research chapters on "Extreme  $\mathcal{L}$ -SuperHyper" and "Neutrosophic  $\mathcal{L}$ -SuperHyper" about some scientific researches on SuperHyper by two (Extreme/Neutrosophic) notions, namely, Extreme  $\mathcal{L}$ -SuperHyper and Neutrosophic  $\mathcal{L}$ -SuperHyper. With scientific researches on the basic properties, the scientific research book starts to make Extreme  $\mathcal{L}$ -SuperHyper theory and Neutrosophic SuperHyper theory more (Extremely/Neutrosophically) understandable.

Some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in the following by Henry Garrett (2022) which is indexed by Google Scholar and has more than 3230 readers in Scribd. It's titled "Beyond Neutrosophic Graphs" and published by Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United State. This research book covers different types of notions and settings in neutrosophic graph theory and neutrosophic SuperHyperGraph theory.

[Ref] Henry Garrett, (2022). "Beyond Neutrosophic Graphs", Ohio: E-publishing: Educational Publisher 1091 West 1st Ave Grandview Heights, Ohio 43212 United States. ISBN: 978-1-59973-725-6 (<http://fs.unm.edu/BeyondNeutrosophicGraphs.pdf>).

Also, some scientific studies and scientific researches about neutrosophic graphs, are proposed as book in the following by Henry Garrett (2022) which is indexed by Google Scholar and has more than 4117 readers in Scribd. It's titled "Neutrosophic Duality" and published by Florida: GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. This research book presents different types of notions SuperHyperResolving and SuperHyperDominating in the setting of duality in neutrosophic graph theory and neutrosophic SuperHyperGraph theory. This research book has scrutiny on the complement of the intended set and the intended set, simultaneously. It's smart to consider a set but acting on its complement that what's done in this research book which is popular in the terms of high readers in Scribd.

[Ref] Henry Garrett, (2022). "Neutrosophic Duality", Florida: GLOBAL KNOWLEDGE - Publishing House 848 Brickell Ave Ste 950 Miami, Florida 33131 United States. ISBN: 978-1-59973-743-0 (<http://fs.unm.edu/NeutrosophicDuality.pdf>).