Total Domination Number and Chromatic Number of a Fuzzy Graph

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ABSTRACT

A subset S of V is called a domination set in G if every vertex in V-S is adjacent to at least one vertex in S. A dominating set is said to be Fuzzy Total Dominating set if every vertex in V is adjacent to at least one vertex in S. Minimum cardinality taken over all total dominating set is called as fuzzy total domination number and is denoted by γ_{ft} (G). The minimum number of colours required to colour all the vertices such that adjacent vertices do not receive the same colour is the chromatic number χ(G). For any graph G a complete sub graph of G is called a clique of G. In this paper we find an upper bound for the sum of the fuzzy total domination and chromatic number in fuzzy graphs and characterize the corresponding extremal fuzzy graphs.

General Terms

G(μ,σ) be simple undirected fuzzy graph

Keywords

Fuzzy Total Domination Number, Chromatic Number, Clique, Fuzzy Graphs

1. INTRODUCTION

The study of dominating sets in graphs was began by Ore and Berge, the domination number, total domination number are introduced by Cockayne and Hedetniemi. A Mathematical framework to describe the phenomena of uncertainty in real life situation is first suggested by L. A. Zadeh in 1965.

Research on the theory of fuzzy sets has been witnessing an exponential growth, both within mathematics and in its applications. This ranges from traditional mathematical subjects like logic, topology, algebra, analysis etc. consequently fuzzy set theory has emerged as potential area of interdisciplinary research and fuzzy graph theory is of recent interest.

The fuzzy definition of fuzzy graphs was proposed by Kaufmann [4], from the fuzzy relations introduced by Zadeh [9]. Although Rosenfeld[5] introduced another elaborated definition, including fuzzy vertex and fuzzy edges. Several fuzzy analogs of graph theoretic concepts such as paths, cycles connectedness etc. The concept of domination in fuzzy graphs was investigated by A.Somasundram, S.Somasundram [6]. A. Somasundram presented the concepts of independent domination, total domination, connected domination and domination in cartesian product and composition of fuzzy graphs[7][8]).

Several authors have studied the problem of obtaining an upper bound for the sum of a domination parameter and a graph theoretic parameter and characterized the corresponding extremal graphs. In [10], Paulraj Joseph J and Arumugam S proved that $\gamma+k\leq p$. In[9], Paulraj Joseph J and Arumugam S proved that γ_c (G)+ $\chi \leq p+1$. They also characterized the class of graphs for which the upper bound is attained. They also proved similar results for γ and γ_c . In[14], Mahadevan G introduced the concept the complementary perfect domination number γ_{cp} and proved that γ_{cp}(G)+ $\chi \leq 2n-2$, and characterized the corresponding extremal graphs. In[15], S.Vimala and J.S.Sathya proved that γ_t (G)+χ(G)=2n-5. They also characterised the class of graphs for which the upper bound is attained. In this paper we obtain sharp upper bound for the sum of the fuzzy total domination number and chromatic number and characterize the corresponding extremal fuzzy graphs.

2. PRELIMINARIES

If X is collection of objects denoted generically by x, then a Fuzzy set $\tilde{A}$ in X is a set of ordered pairs: $\tilde{A} = \{(x, \mu_{\tilde{A}}(x))/ x \in X\}$. $\mu_{\tilde{A}}(x)$ is called the membership function of x in $\tilde{A}$ that maps X to the membership space M (when M contains only the two points 0 and 1). Let E be the (crisp) set of nodes. A fuzzy graph is then defined by, $\tilde{G}(x_i, x_j) = \{(x_i, x_j), \mu_{\tilde{G}}(x_i, x_j)/(x_i, x_j) \in E \times E\}$. $\tilde{H}(x_i, x_j)$ is a Fuzzy Sub graph of $\tilde{G}(x_i, x_j)$ if $\mu_{\tilde{H}}(x_i, x_j) \leq \mu_{\tilde{G}}(x_i, x_j) \forall (x_i, x_j) \in E \times E$, $\tilde{H}(x_i, x_j)$ is a spanning fuzzy sub graph of $\tilde{G}(x_i, x_j)$ if the node set of $\tilde{H}(x_i, x_j)$ and $\tilde{G}(x_i, x_j)$ are equal, that is if they differ only in their arc weights.

Let G(μ,σ) be simple undirected fuzzy graph. The degree of any vertex u in G is the number of edges incident with u and is denoted by d(u). The minimum and maximum degree of a vertex is denoted by δ(G) and Δ(G) respectively. P_n denotes the path on n vertices. The vertex connectivity κ(G) of a graph G is the minimum number of vertices whose removal results in a disconnected graph. The chromatic number χ is defined to be the minimum number of colours required to colour all the vertices such that adjacent vertices do not receive the same colour. For any graph G a complete sub graph of G is called a clique of G. The number of vertices in a largest clique of G is called the clique number of G.

A subset S of V is called a dominating set in G, if every vertex in V-S is adjacent to at least one vertex is S. The minimum cardinality taken over all minimal dominating sets in G is called the domination number of G and is denoted by γ. A dominating set S is said to be fuzzy total dominating set if every vertex in V is adjacent to at least one vertex in S. Minimum cardinality taken over all total dominating set is called as fuzzy total domination number and is denoted by γ_{ft} (G). We use the following previous results.

2.1 Theorem: [1]: For any connected graph G, γ_t (G) $\leq n$

2.2 Theorem: [2]: For any connected graph G, χ(G)$\leq \Delta$(G)+1.

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Review of Domination number and Chromatic number in Turiyam Neutrosophic and Plithogenic Graphs Takaaki Fujita,Florentin Smarandache, Graph theory is the study of networks comprising nodes vertices and their connections edges It is instrumental in analyzing the structure pathways and properties of these networks This paper explores two significant problems in graph theory the domination number and the chromatic number The domination number represents the smallest subset of vertices such that every vertex in the graph is either included in this subset or adjacent to at least one vertex within it The chromatic number on the other hand refers to the minimum number of colors needed to color a graph such that no two adjacent vertices share the same color Additionally the paper introduces and examines uncertain graph models including Fuzzy Intuitionistic Fuzzy Neutrosophic Turiyam Neutrosophic and Plithogenic graphs It further investigates their respective domination and chromatic numbers providing insights into these advanced graph concepts

The Journal of Fuzzy Mathematics ,2005 **Neutrosophic Sets and Systems, vol. 56/2023** Florentin Smarandache,Mohamed Abdel-Basset,Said Broumi,2024-03-20 Neutrosophic Sets and Systems has been created for publications on advanced studies in neutrosophy neutrosophic set neutrosophic logic neutrosophic probability neutrosophic statistics that started in 1995 and their applications in any field such as the neutrosophic structures developed in algebra geometry topology etc Neutrosophy is a new branch of philosophy that studies the origin nature and scope of neutralities as well as their interactions with different ideational spectra This theory considers every notion or idea together with its opposite or negation and with their spectrum of neutralities in between them i e notions or ideas supporting neither nor The and ideas together are referred to as Neutrosophy is a generalization of Hegel s dialectics the last one is based on and only According to this theory every idea tends to be neutralized and balanced by and ideas as a state of equilibrium In a classical way are disjoint two by two But since in many cases the borders between notions are vague imprecise Sorites it is possible that and of course have common parts two by two or even all three of them as well Neutrosophic Set and Neutrosophic Logic are generalizations of the fuzzy set and respectively fuzzy logic especially of intuitionistic fuzzy set and respectively intuitionistic fuzzy logic In neutrosophic logic a proposition has a degree of truth T a degree of indeterminacy I and a degree of falsity F where T I F are standard or non standard subsets of 0 1 Neutrosophic Probability is a generalization of the classical probability and imprecise probability Neutrosophic Statistics is a generalization of the classical statistics

Neutrosophic Sets and Systems, Vol. 90, 2025 Florentin Smarandache,Mohamed Abdel-Basset,Maikel Leyva Vazquez, This issue of Neutrosophic Sets and Systems presents a collection of advanced studies in neutrosophy and its applications across various fields extending concepts like fuzzy sets and logic The papers address topics related to managing uncertainty indeterminacy and ambiguity in complex systems Key applications include mathematics such as fixed point theorems and topological spaces and engineering problems such as highway asphalt pavement maintenance and traffic

management The issue also explores the use of neutrosophic frameworks in decision making and evaluation with articles on e commerce website quality supply chain performance academic teaching assessment and the evaluation of hotel service quality Other papers apply the neutrosophic approach to areas like stock market analysis green technology innovation and the automated generation of digital media content The research demonstrates the utility of neutrosophic theory in providing robust and transparent solutions where traditional deterministic models may fall short Neutrosophic Sets and Systems, Vol. 47, 2021 Florentin Smarandache,Mohamed Abdel-Basser,Said Broumi,2021-12-30 Papers on neutrosophic statistics neutrosophic probability plithogenic set paradoxism neutrosophic set NeutroAlgebra etc and their applications

Exploring Concepts of HyperFuzzy, HyperNeutrosophic, and HyperPlithogenic Sets (II) Takaaki Fujita,Florentin Smarandache ,2025-01-01 This paper delves into the advancements of classical set theory to address the complexities and uncertainties inherent in real world phenomena It highlights three major extensions of traditional set theory Fuzzy Sets 288 Neutrosophic Sets 237 and Plithogenic Sets 243 and examines their further generalizations into Hyperfuzzy 106 HyperNeutrosophic 90 and Hyperplithogenic Sets 90 Building on previous research 83 this study explores the potential applications of HyperNeutrosophic Sets and SuperHyperNeutrosophic Sets across various domains Specifically it extends f undamental c oncepts such as Neutrosophic Logic Cognitive Maps Graph Neural Networks Classifiers and Triplet Groups through these advanced set structures and briefly a nalyzes t heir m athematical properties *International Journal of Applied Mathematics* ,2006 **Some Graph Parameters for Superhypertree-width and Neutrosophic tree-width** Takaaki Fujita,Florentin Smarandache, Graph characteristics are often studied through various parameters with ongoing research dedicated to exploring these aspects Among these graph width parameters such as tree width are particularly important due to their practical applications in algorithms and real world problems A hypergraph generalizes traditional graph theory by abstracting and extending its concepts 77 More recently the concept of a SuperHyperGraph has been introduced as a further generalization of the hypergraph Neutrosophic logic 133 a mathematical framework extends classical and fuzzy logic by allowing the simultaneous consideration of truth indeterminacy and falsity within an interval In this paper we explore Superhypertree width Neutrosophic tree width and t Neutrosophic tree width **Advancing Uncertain Combinatorics through Graphization, Hyperization, and Uncertainization: Fuzzy, Neutrosophic, Soft, Rough, and Beyond** Takaaki Fujita,Florentin Smarandache,2025-01-15 This book represents the fourth volume in the series Collected Papers on Advancing Uncertain Combinatorics through Graphization Hyperization and Uncertainization Fuzzy Neutrosophic Soft Rough and Beyond This volume specifically delves into the concept of the HyperUncertain Set building on the foundational advancements introduced in previous volumes The series aims to explore the ongoing evolution of uncertain combinatorics through innovative methodologies such as graphization hyperization and uncertainization These approaches integrate and extend core concepts from fuzzy neutrosophic soft and rough set theories providing robust frameworks to

model and analyze the inherent complexity of real world uncertainties At the heart of this series lies combinatorics and set theory cornerstones of mathematics that address the study of counting arrangements and the relationships between collections under defined rules Traditionally combinatorics has excelled in solving problems involving uncertainty while advancements in set theory have expanded its scope to include powerful constructs like fuzzy and neutrosophic sets These advanced sets bring new dimensions to uncertainty modeling by capturing not just binary truth but also indeterminacy and falsity In this fourth volume the integration of set theory with graph theory takes center stage culminating in graphized structures such as hypergraphs and superhypergraphs These structures paired with innovations like Neutrosophic Oversets Undersets Offsets and the Nonstandard Real Set extend the boundaries of mathematical abstraction This fusion of combinatorics graph theory and uncertain set theory creates a rich foundation for addressing the multidimensional and hierarchical uncertainties prevalent in both theoretical and applied domains The book is structured into thirteen chapters each contributing unique perspectives and advancements in the realm of HyperUncertain Sets and their related frameworks The first chapter Advancing Traditional Set Theory with Hyperfuzzy Hyperneutrosophic and Hyperplithogenic Sets explores the evolution of classical set theory to better address the complexity and ambiguity of real world phenomena By introducing hierarchical structures like hyperstructures and superhyperstructures created through iterative applications of power sets it lays the groundwork for more abstract and adaptable mathematical tools The focus is on extending three foundational frameworks Fuzzy Sets Neutrosophic Sets and Plithogenic Sets into their hyperforms Hyperfuzzy Sets Hyperneutrosophic Sets and Hyperplithogenic Sets These advanced concepts are applied across diverse fields such as statistics clustering evolutionary theory topology decision making probability and language theory The goal is to provide a robust platform for future research in this expanding area of study The second chapter Applications and Mathematical Properties of Hyperneutrosophic and SuperHyperneutrosophic Sets extends the work on Hyperfuzzy Hyperneutrosophic and Hyperplithogenic Sets by delving into their advanced applications and mathematical foundations Building on prior research it specifically examines Hyperneutrosophic and SuperHyperneutrosophic Sets exploring their integration into Neutrosophic Logic Cognitive Maps Graph Neural Networks Classifiers and Triplet Groups The chapter also investigates their mathematical properties and applicability in addressing uncertainties and complexities inherent in various domains These insights aim to inspire innovative uses of hypergeneralized sets in modern theoretical and applied research The third chapter New Extensions of Hyperneutrosophic Sets Bipolar Pythagorean Double Valued and Interval Valued Sets studies advanced variations of Neutrosophic Sets a mathematical framework defined by three membership functions truth T indeterminacy I and falsity F By leveraging the concepts of Hyperneutrosophic and SuperHyperneutrosophic Sets the study extends Bipolar Neutrosophic Sets Interval Valued Neutrosophic Sets Pythagorean Neutrosophic Sets and Double Valued Neutrosophic Sets These extensions address increasingly complex scenarios and a brief analysis is provided to explore their potential

applications and mathematical underpinnings Building on prior research the fourth chapter Hyperneutrosophic Extensions of Complex Single Valued Triangular Fermatean and Linguistic Sets expands on Neutrosophic Set theory by incorporating recent advancements in Hyperneutrosophic and SuperHyperneutrosophic Sets The study focuses on extending Complex Neutrosophic Sets Single Valued Triangular Neutrosophic Sets Fermatean Neutrosophic Sets and Linguistic Neutrosophic Sets The analysis highlights the mathematical structures of these hyperextensions and explores their connections with existing set theoretic concepts offering new insights into managing uncertainty in multidimensional challenges The fifth chapter Advanced Extensions of Hyperneutrosophic Sets Dynamic Quadripartitioned Pentapartitioned Heptapartitioned and m Polar delves deeper into the evolution of Neutrosophic Sets by exploring advanced frameworks designed for even more intricate applications New extensions include Dynamic Neutrosophic Sets Quadripartitioned Neutrosophic Sets Pentapartitioned Neutrosophic Sets Heptapartitioned Neutrosophic Sets and m Polar Neutrosophic Sets These developments build upon foundational research and aim to provide robust tools for addressing multidimensional and highly nuanced problems The sixth chapter Advanced Extensions of Hyperneutrosophic Sets Cubic Trapezoidal q Rung Orthopair Overset Underset and Offset builds upon the Neutrosophic framework which employs truth T indeterminacy I and falsity F to address uncertainty Leveraging advancements in Hyperneutrosophic and SuperHyperneutrosophic Sets the study extends Cubic Neutrosophic Sets Trapezoidal Neutrosophic Sets q Rung Orthopair Neutrosophic Sets Neutrosophic Oversets Neutrosophic Undersets and Neutrosophic Offsets The chapter provides a brief analysis of these new set types exploring their properties and potential applications in solving multidimensional problems The seventh chapter Specialized Classes of Hyperneutrosophic Sets Support Paraconsistent and Faillibilist Sets delves into unique classes of Neutrosophic Sets extended through Hyperneutrosophic and SuperHyperneutrosophic frameworks to tackle advanced theoretical challenges The study introduces and extends Support Neutrosophic Sets Neutrosophic Intuitionistic Sets Neutrosophic Paraconsistent Sets Neutrosophic Faillibilist Sets Neutrosophic Paradoxist and Pseudo Paradoxist Sets Neutrosophic Tautological and Nihilist Sets Neutrosophic Dialetheist Sets and Neutrosophic Trivialist Sets These extensions address highly nuanced aspects of uncertainty further advancing the theoretical foundation of Neutrosophic mathematics The eight chapter MultiNeutrosophic Sets and Refined Neutrosophic Sets focuses on two advanced Neutrosophic frameworks MultiNeutrosophic Sets and Refined Neutrosophic Sets Using Hyperneutrosophic and nn SuperHyperneutrosophic Sets these extensions are analyzed in detail highlighting their adaptability to multidimensional and complex scenarios Examples and mathematical properties are provided to showcase their practical relevance and theoretical depth The ninth chapter Advanced Hyperneutrosophic Set Types Type m Nonstationary Subset Valued and Complex Refined explores extensions of the Neutrosophic framework focusing on Type m Neutrosophic Sets Nonstationary Neutrosophic Sets Subset Valued Neutrosophic Sets and Complex Refined Neutrosophic Sets These extensions utilize the Hyperneutrosophic and

SuperHyperneutrosophic frameworks to address advanced challenges in uncertainty management expanding their mathematical scope and practical applications The tenth chapter Hyperfuzzy Hypersoft Sets and Hyperneutrosophic Hypersoft Sets integrates the principles of Fuzzy Neutrosophic and Soft Sets with hyperstructures to introduce Hyperfuzzy Hypersoft Sets and Hyperneutrosophic Hypersoft Sets These frameworks are designed to manage complex uncertainty through hierarchical structures based on power sets with detailed analysis of their properties and theoretical potential The eleventh chapter A Review of SuperFuzzy SuperNeutrosophic and SuperPlithogenic Sets revisits and extends the study of advanced set concepts such as SuperFuzzy Sets Super Intuitionistic Fuzzy Sets Super Neutrosophic Sets and SuperPlithogenic Sets including their specialized variants like quadripartitioned pentapartitioned and heptapartitioned forms The work serves as a consolidation of existing studies while highlighting potential directions for future research in hierarchical uncertainty modeling Focusing on decision making under uncertainty the tweve chapter Advanced SuperHypersoft and TreeSoft Sets introduces six novel concepts SuperHypersoft Rough Sets SuperHypersoft Expert Sets Bipolar SuperHypersoft Sets TreeSoft Rough Sets TreeSoft Expert Sets and Bipolar TreeSoft Sets Definitions properties and potential applications of these frameworks are explored to enhance the flexibility of soft set based models The final chapter Hierarchical Uncertainty in Fuzzy Neutrosophic and Plithogenic Sets provides a comprehensive survey of hierarchical uncertainty frameworks with a focus on Plithogenic Sets and their advanced extensions Hyperplithogenic Sets SuperHyperplithogenic Sets It examines relationships with other major concepts such as Intuitionistic Fuzzy Sets Vague Sets Picture Fuzzy Sets Hesitant Fuzzy Sets and multi partitioned Neutrosophic Sets consolidating their theoretical interconnections for modeling complex systems This volume not only reflects the dynamic interplay between theoretical rigor and practical application but also serves as a beacon for future research in uncertainty modeling offering advanced tools to tackle the intricacies of modern challenges **Modern Trends in Fuzzy Graph Theory** Madhumangal Pal,Sovan Samanta,Ganesh Ghorai,2020-11-02 This book provides an extensive set of tools for applying fuzzy mathematics and graph theory to real life problems Balancing the basics and latest developments in fuzzy graph theory this book starts with existing fundamental theories such as connectivity isomorphism products of fuzzy graphs and different types of paths and arcs in fuzzy graphs to focus on advanced concepts such as planarity in fuzzy graphs fuzzy competition graphs fuzzy threshold graphs fuzzy tolerance graphs fuzzy trees coloring in fuzzy graphs bipolar fuzzy graphs intuitionistic fuzzy graphs m polar fuzzy graphs applications of fuzzy graphs and more Each chapter includes a number of key representative applications of the discussed concept An authoritative self contained and inspiring read on the theory and modern applications of fuzzy graphs this book is of value to advanced undergraduate and graduate students of mathematics engineering and computer science as well as researchers interested in new developments in fuzzy logic and applied mathematics Mathematical Reviews ,2001

Graph-Theoretic Problems and Their New Applications Frank Werner,2020-05-27 Graph theory is an important area

of applied mathematics with a broad spectrum of applications in many fields This book results from aSpecialIssue in the journal Mathematics entitled Graph Theoretic Problems and Their New Applications It contains 20 articles covering a broad spectrum of graph theoretic works that were selected from 151 submitted papers after a thorough refereeing process Among others it includes a deep survey on mixed graphs and their use for solutions ti scheduling problems Other subjects include topological indices domination numbers of graphs domination games contraction mappings and neutrosophic graphs Several applications of graph theory are discussed e g the use of graph theory in the context of molecular processes *Fuzzy Graph Theory with Applications to Human Trafficking* John N. Mordeson,Sunil Mathew,Davender S. Malik,2018-03-14 This book reports on advanced concepts in fuzzy graph theory showing a set of tools that can be successfully applied to understanding and modeling illegal human trafficking Building on the previous book on fuzzy graph by the same authors which set the fundamentals for readers to understand this developing field of research this second book gives a special emphasis to applications of the theory For this authors introduce new concepts such as intuitionistic fuzzy graphs the concept of independence and domination in fuzzy graphs as well as directed fuzzy networks incidence graphs and many more

Advanced Topics in Fuzzy Graph Theory John N. Mordeson,Sunil Mathew,2018-12-13 This book builds on two recently published books by the same authors on fuzzy graph theory Continuing in their tradition it provides readers with an extensive set of tools for applying fuzzy mathematics and graph theory to social problems such as human trafficking and illegal immigration Further it especially focuses on advanced concepts such as connectivity and Wiener indices in fuzzy graphs distance operations on fuzzy graphs involving t norms and the application of dialectic synthesis in fuzzy graph theory Each chapter also discusses a number of key representative applications Given its approach the book provides readers with an authoritative self contained guide to and at the same time an inspiring read on the theory and modern applications of fuzzy graphs For newcomers the book also includes a brief introduction to fuzzy sets fuzzy relations and fuzzy graphs

Graphical Analysis of Covering and Paired Domination in the Environment of Neutrosophic Information Sami Ullah Khan,Abdul Nasir, Naeem Jan,Zhen-Hua Ma, Neutrosophic graph NG is a powerful tool in graph theory which is capable of modeling many real life problems with uncertainty due to unclear varying and indeterminate information Meanwhile the fuzzy graphs FGs and intuitionistic fuzzy graphs IFGs may not handle these problems as efficiently as NGs It is difficult to model uncertainty due to imprecise information and vagueness in real world scenarios Many real life optimization problems are modeled and solved using the well known fuzzy graph theory **Dongbei daxue xuebao** ,2008

Soviet Journal of Computer and Systems Sciences ,1986-07 **Sociological Abstracts** ,1992 **Documentation Abstracts** ,1992 **Domination Theory And Beyond** Dr. Henry Garrett,2023-02-01 In this research book there are some research chapters on Domination Theory And Beyond With researches on the basic properties the research book starts to make Domination Theory And Beyond more understandable Some studies and 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 2498 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 studies and 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 3218 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 KNOW LEDGE Publishing House 848 Brickell Ave Ste 950 Miami Florida 33131 United States ISBN 978 1 59973 743 0 http fs unm edu NeutrosophicDuality pdf section Background There are some researches covering the topic of this research In what follows there are some discussion and literature reviews about them First article is titled properties of SuperHyperGraph and neutrosophic SuperHyperGraph in textbf Ref cite HG1 by Henry Garrett 2022 It s first step toward the research on neutrosophic SuperHyperGraphs This research article is published on the journal Neutrosophic Sets and Systems in issue 49 and the pages 531 561 In this research article different types of notions like dominating resolving coloring Eulerian Hamiltonian neutrosophic path n Eulerian Hamiltonian neutrosophic path zero forcing number zero forcing neutrosophic number independent number independent neutrosophic number clique number clique neutrosophic number matching number matching neutrosophic number girth neutrosophic girth 1 zero forcing number 1 zero forcing neutrosophic number failed 1 zero forcing number failed 1 zero forcing neutrosophic number global offensive alliance t offensive alliance t defensive alliance t powerful alliance and global powerful alliance are defined in SuperHyperGraph and neutrosophic SuperHyperGraph Some Classes of SuperHyperGraph and Neutrosophic SuperHyperGraph are cases of research Some results are applied in family of SuperHyperGraph and neutrosophic SuperHyperGraph Thus this research article has concentrated on the vast notions and introducing the majority of notions 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 textbf Ref cite HG2 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 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 textbf Ref cite HG3 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 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 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 textbf Ref cite HG4 by Henry Garrett 2022 0049 Failed 1 Zero Forcing Number in Neutrosophic Graphs in textbf Ref cite 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 textbf Ref cite 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 textbf Ref cite HG7 by Henry Garrett 2022 Neutrosophic Version Of Separates Groups Of Cells In Cancer s Recognition On Neutrosophic SuperHyperGraphs in textbf Ref cite 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 textbf Ref cite 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 textbf Ref cite 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 textbf Ref cite HG11 by Henry Garrett 2022 Extremism of the Attacked Body Under the Cancer s Circumstances Where Cancer s Recognition Titled Neutrosophic SuperHyperGraphs in textbf Ref cite HG12 by Henry Garrett 2022 Neutrosophic 1 Failed SuperHyperForcing in Cancer s Recognitions And Neutrosophic SuperHyperGraphs in textbf Ref cite HG13 by Henry Garrett 2022 Neutrosophic Messy Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer s

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Neutrosophic Regions titled neutrosophic Failed SuperHyperStable in Cancer s Neutrosophic Recognition modeled in the Form of Neutrosophic SuperHyperGraphs in textbf Ref cite HG30 by Henry Garrett 2023 Using the Tool As Neutrosophic Failed SuperHyperStable To SuperHyperModel Cancer s Recognition Titled Neutrosophic SuperHyperGraphs in textbf Ref cite HG31 by Henry Garrett 2023 Neutrosophic Messy Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer s Neutrosophic Recognitions In Special ViewPoints in textbf Ref cite HG32 by Henry Garrett 2023 Neutrosophic SuperHyperStable on Cancer s Recognition by Well SuperHyperModelled Neutrosophic SuperHyperGraphs in textbf Ref cite HG33 by Henry Garrett 2023 Neutrosophic 1 Failed SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer s Neutrosophic Recognition And Beyond in textbf Ref cite HG34 by Henry Garrett 2022 Neutrosophic 1 Failed SuperHyperForcing in Cancer s Recognitions And Neutrosophic SuperHyperGraphs in textbf Ref cite HG35 by Henry Garrett 2022 Basic Notions on Neutrosophic SuperHyperForcing And Neutrosophic SuperHyperModeling in Cancer s Recognitions And Neutrosophic SuperHyperGraphs in textbf Ref cite HG36 by Henry Garrett 2022 Basic Neutrosophic Notions Concerning SuperHyperDominating and Neutrosophic SuperHyperResolving in SuperHyperGraph in textbf Ref cite HG37 by Henry Garrett 2022 Initial Material of Neutrosophic Preliminaries to Study Some Neutrosophic Notions Based on Neutrosophic SuperHyperEdge NSHE in Neutrosophic SuperHyperGraph NSHG in textbf Ref cite HG38 by Henry Garrett 2022 there are some endeavors to formalize the basic SuperHyperNotions about neutrosophic SuperHyperGraph and SuperHyperGraph Some studies and researches about neutrosophic graphs are proposed as book in textbf Ref cite HG39 by Henry Garrett 2022 which is indexed by Google Scholar and has more than 2732 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 studies and researches about neutrosophic graphs are proposed as book in textbf Ref cite HG40 by Henry Garrett 2022 which is indexed by Google Scholar and has more than 3504 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 begin thebibliography 595 bibitem HG1 Henry Garrett textit Properties of SuperHyperGraph and Neutrosophic SuperHyperGraph Neutrosophic Sets and Systems 49 2022 531 561 doi 10 5281 zenodo 6456413 http fs unm edu NSS NeutrosophicSuperHyperGraph34 pdf https digitalrepository unm edu nss _journal vol49 iss1 34 bibitem HG2 Henry Garrett textit 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 bibitem HG3 Henry Garrett textit 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 bibitem HG4 Garrett Henry textit 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 https doi org 10 5281 zenodo 6319942 https oa mg work 10 5281 zenodo 6319942 bibitem HG5 Garrett Henry textit 0049 Failed 1 Zero Forcing Number in Neutrosophic Graphs CERN European Organization for Nuclear Research Zenodo Feb 2022 CERN European Organization for Nuclear Research https doi org 10 13140 rg 2 2 35241 26724 https oa mg work 10 13140 rg 2 2 35241 26724 bibitem HG6 Henry Garrett textit Extreme SuperHyperClique as the Firm Scheme of Confrontation under Cancer s Recognition as the Model in The Setting of Neutrosophic SuperHyperGraphs Preprints 2023 2023010308 doi 10 20944 preprints202301 0308 v1 bibitem HG7 Henry Garrett textit 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 Preprints 2023 2023010282 doi 10 20944 preprints202301 0282 v1 bibitem HG8 Henry Garrett textit Neutrosophic Version Of Separates Groups Of Cells In Cancer s Recognition On Neutrosophic SuperHyperGraphs Preprints 2023 2023010267 doi 10 20944 preprints202301 0267 v1 bibitem HG9 Henry Garrett textit 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 Preprints 2023 2023010265 doi 10 20944 preprints202301 0265 v1 bibitem HG10 Henry Garrett textit 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 Preprints 2023 2023010262 doi 10 20944 preprints202301 0262 v1 bibitem HG11 Henry Garrett textit Neutrosophic Failed SuperHyperStable as the Survivors on the Cancer s Neutrosophic Recognition Based on Uncertainty to All Modes in Neutrosophic SuperHyperGraphs Preprints 2023 2023010240 doi 10 20944 preprints202301 0240 v1 bibitem HG12 Henry Garrett textit Extremism of the Attacked Body Under the Cancer s Circumstances Where Cancer s Recognition Titled Neutrosophic SuperHyperGraphs Preprints 2023 2023010224 doi 10 20944 preprints202301 0224 v1 bibitem HG13 Henry Garrett textit Neutrosophic 1 Failed SuperHyperForcing in Cancer s Recognitions And Neutrosophic SuperHyperGraphs Preprints 2023 2023010105 doi 10 20944 preprints202301 0105 v1 bibitem HG14 Henry Garrett textit Neutrosophic Messy Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer s Neutrosophic Recognitions In Special ViewPoints Preprints 2023 2023010088 doi 10 20944 preprints202301 0088 v1 bibitem HG15 Henry Garrett textit Neutrosophic 1 Failed

SuperHyperForcing in the SuperHyperFunction To Use Neutrosophic SuperHyperGraphs on Cancer s Neutrosophic Recognition And Beyond Preprints 2023 2023010044 bibitem HG16 Henry Garrett textit Neutrosophic SuperHyperStable on Cancer s Recognition by Well SuperHyperModelled Neutrosophic SuperHyperGraphs Preprints 2023 2023010043 doi 10 20944 preprints202301 0043 v1 bibitem HG17 Henry Garrett textit Basic Notions on Neutrosophic SuperHyperForcing And Neutrosophic SuperHyperModeling in Cancer s Recognitions And Neutrosophic SuperHyperGraphs Preprints 2023 2023010105 doi 10 20944 preprints202301 0105 v1 bibitem HG18 Henry Garrett textit Neutrosophic Messy Style SuperHyperGraphs To Form Neutrosophic SuperHyperStable To Act on Cancer s Neutrosophic Recognitions In Special ViewPoints Preprints 2023 2023010088 doi 10 20944 preprints202301 0088 v1 bibitem HG19 Henry Garrett textit Neutrosophic SuperHyperModeling of Cancer s Recognitions Featuring Neutrosophic SuperHyperDefensive SuperHyperAlliances Preprints 2022 2022120549 doi 10 20944 preprints202212 0549 v1 bibitem HG20 Henry Garrett textit 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 bibitem HG21 Henry Garrett textit SuperHyperGirth on SuperHyperGraph and Neutrosophic SuperHyperGraph With SuperHyperModeling of Cancer s Recognitions Preprints 2022 2022120500 doi 10 20944 preprints202212 0500 v1 bibitem HG22 Henry Garrett textit 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 bibitem HG23 Henry Garrett textit SuperHyperDominating and SuperHyperResolving on Neutrosophic SuperHyperGraphs And Their Directions in Game Theory and Neutrosophic SuperHyperClasses Preprints 2022 2022110576 doi 10 20944 preprints202211 0576 v1 bibitem HG24 Henry Garrett textit SuperHyperMatching By R Definitions And Polynomials To Monitor Cancer s Recognition In Neutrosophic SuperHyperGraphs ResearchGate 2023 doi 10 13140 RG 2 2 35061 65767 bibitem HG25 Henry Garrett textit The Focus on The Partitions Obtained By Parallel Moves In The Cancer s Extreme Recognition With Different Types of Extreme SuperHyperMatching Set and Polynomial on Neutrosophic SuperHyperGraphs ResearchGate 2023 doi 10 13140 RG 2 2 18494 15680 bibitem HG26 Henry Garrett textit Extreme Failed SuperHyperClique Decides the Failures on the Cancer s Recognition in the Perfect Connections of Cancer s Attacks By SuperHyperModels Named Neutrosophic SuperHyperGraphs ResearchGate 2023 doi 10 13140 RG 2 2 32530 73922 bibitem HG27 Henry Garrett textit 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 ResearchGate 2023 doi 10 13140 RG 2 2 15897 70243 bibitem HG28 Henry Garrett textit Perfect Directions Toward Idealism in Cancer s Neutrosophic Recognition Forwarding Neutrosophic SuperHyperClique on Neutrosophic SuperHyperGraphs ResearchGate 2023 doi 10 13140 RG 2 2 30092 80004

bibitem HG29 Henry Garrett textit Demonstrating Complete Connections in Every Embedded Regions and Sub Regions in the Terms of Cancer s Recognition and Neutrosophic SuperHyperGraphs With Neutrosophic SuperHyperClique ResearchGate 2023 doi 10 13140 RG 2 2 23172 19849 bibitem HG30 Henry Garrett textit 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 bibitem HG31 Henry Garrett textit 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 bibitem HG32 Henry Garrett textit 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 bibitem HG33 Henry Garrett textit Neutrosophic SuperHyperStable on Cancer s Recognition by Well SuperHyperModelled Neutrosophic SuperHyperGraphs ResearchGate 2023 doi 10 13140 RG 2 2 35774 77123 bibitem HG34 Henry Garrett textit 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 bibitem HG35 Henry Garrett textit Neutrosophic 1 Failed SuperHyperForcing in Cancer s Recognitions And Neutrosophic SuperHyperGraphs ResearchGate 2022 doi 10 13140 RG 2 2 29430 88642 bibitem HG36 Henry Garrett textit 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 bibitem HG37 Henry Garrett textit Basic Neutrosophic Notions Concerning SuperHyperDominating and Neutrosophic SuperHyperResolving in SuperHyperGraph ResearchGate 2022 doi 10 13140 RG 2 2 29173 86244 bibitem HG38 Henry Garrett textit 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 bibitem HG39 Henry Garrett 2022 textit Beyond Neutrosophic Graphs Ohio E publishing Educational Publisher 1091 West 1st Ave Grandview Heights Ohio 43212 United States ISBN 979 1 59973 725 6 http fs unm edu BeyondNeutrosophicGraphs pdf bibitem HG40 Henry Garrett 2022 textit 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 end thebibliography

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The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Journal For Fuzzy Graph Theory Domination Number.

Table of Contents Journal For Fuzzy Graph Theory Domination Number

1. Understanding the eBook Journal For Fuzzy Graph Theory Domination Number
    - The Rise of Digital Reading Journal For Fuzzy Graph Theory Domination Number
    - Advantages of eBooks Over Traditional Books
2. Identifying Journal For Fuzzy Graph Theory Domination Number
    - Exploring Different Genres
    - Considering Fiction vs. Non-Fiction
    - Determining Your Reading Goals
3. Choosing the Right eBook Platform
    - Popular eBook Platforms
    - Features to Look for in an Journal For Fuzzy Graph Theory Domination Number
    - User-Friendly Interface
4. Exploring eBook Recommendations from Journal For Fuzzy Graph Theory Domination Number
    - Personalized Recommendations
    - Journal For Fuzzy Graph Theory Domination Number User Reviews and Ratings
    - Journal For Fuzzy Graph Theory Domination Number and Bestseller Lists
5. Accessing Journal For Fuzzy Graph Theory Domination Number Free and Paid eBooks
    - Journal For Fuzzy Graph Theory Domination Number Public Domain eBooks
    - Journal For Fuzzy Graph Theory Domination Number eBook Subscription Services
    - Journal For Fuzzy Graph Theory Domination Number Budget-Friendly Options
6. Navigating Journal For Fuzzy Graph Theory Domination Number eBook Formats
    - ePub, PDF, MOBI, and More
    - Journal For Fuzzy Graph Theory Domination Number Compatibility with Devices
    - Journal For Fuzzy Graph Theory Domination Number Enhanced eBook Features
7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Journal For Fuzzy Graph Theory Domination Number
    - Highlighting and Note-Taking Journal For Fuzzy Graph Theory Domination Number
    - Interactive Elements Journal For Fuzzy Graph Theory Domination Number

8. Staying Engaged with Journal For Fuzzy Graph Theory Domination Number
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Journal For Fuzzy Graph Theory Domination Number
9. Balancing eBooks and Physical Books Journal For Fuzzy Graph Theory Domination Number
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Journal For Fuzzy Graph Theory Domination Number
10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
11. Cultivating a Reading Routine Journal For Fuzzy Graph Theory Domination Number
    - Setting Reading Goals Journal For Fuzzy Graph Theory Domination Number
    - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Journal For Fuzzy Graph Theory Domination Number
    - Fact-Checking eBook Content of Journal For Fuzzy Graph Theory Domination Number
    - Distinguishing Credible Sources
13. Promoting Lifelong Learning
    - Utilizing eBooks for Skill Development
    - Exploring Educational eBooks
14. Embracing eBook Trends
    - Integration of Multimedia Elements
    - Interactive and Gamified eBooks

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