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SOME TYPES OF IDEALS IN SYMMETRIC RINGS

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ABSTRACT. In Ring theory, a branch of abstract algebra, an ideal is a special subset of a ring. Ring theory is an extension of Group theory. Ideals generalize certain subsets of the integers, such as the even number or the multiple of 3. The concept of an order ideal in order theory is derived from the notion of ideal in ring theory. Ideals were introduced by Marshall H. Stone, who derived their name from the ring ideals of Abstract algebra. Ideals were proposed by Richard Dedekind in 1876 in the third edition of his book Vorlesungen Uber Zahlentheore (English: Lecturers on Number Theory). They were a generalization of the concept of ideal numbers developed by Ernt Kummer. Later the concept was expanded by David Hilbert and especially Emmy Noether. In this paper we would like to introduce a new type of ideals in symmetric ring that is in two cases of S_2^* ring, S_3^* ring and we define two type of ideals in S_2^* ring, S_3^* ring. We give some properties of symmetric ideals and symmetric group and we introduce a new concept of reverse composition and plus circle compo.

1. INTRODUCTION

In algebra, which is a broad division of mathematics, Abstract algebra is a study of algebraic structures. Algebraic structures include groups, rings, fields, modules, vector spaces, lattices and algebras. The term abstract algebra was coined in the early 20^{th} century to distinguish this area of study from the other

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Key words and phrases. symmetric group, symmetric rings, (S_2^*, S_3^* ring) symmetric ideals, reverse composition function.

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Introduction to Symmetric Semigroups and Symmetric Semirings

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Abstract
The new concepts introduced in this paper are symmetric semigroups and symmetric semirings. Some results based on the above concepts are studied here and also we define composite regular and reverse composite regular in symmetric group.
Keywords: *Symmetric group, Symmetric Ring, Symmetric Semigroup, Symmetric Semiring, Composite regular , Reverse composite regular,Composition, Reverse Composition, Plus Circle Compo.*

I. Introduction:

Abstract Algebra is a study of algebraic structures. Algebraic structures include groups, rings, fields, modules, vector spaces, lattices and algebras. The term abstract algebra was coined in the early 20^{th} century to distinguish this area of study from the other parts of algebra. Permutations were studied by Joseph-Louis Lagrange in 1770 in his paper Refexions sur la resolutions algebriquedes equations devoted to solutions of algebraic equations in which he introduced Lagrange reselvents. Paolo Ruffini was the first person to develop the theory of permutation groups. The next step was taken by Evarsite Galois in 1832 although his work remained unpublished until 1846, when he considered for the first time what is now called the closure property of a group of permutations. Permutation groups are central to the study of geometric symmetries and to Galois Theory, the study of finding solutions of polynomial equations. Symmetric groups on infinite sets behave quite differently from symmetric groups on finite sets , and are discussed in Scott 1987 , Dixon &Mortimer 1996 and Cameron 1999.The representation theory of semigroups was developed in 1963 by Boris Schelin Using binary relations on a set A and composition of relations for the semigroup product. At an algebraic conference in 1972 Schelin surveyed the literature on B_A, the semigroup of relation on A. In 1997 Schelin and Ralph Mckenzie proved that every semigroup is isomorphic to a transitive semigroup of binary relations. In recent years researchers in the field have become more specialized with dedicated monographs appearing on important classes of semigroups, like inverse semigroups, as well as monographs focusing on applications in algebraic automata theory, and also in functional analysis. In abstract algebra, a semiring is an algebraic structure similar to a ring, but each element must have an additive inverse .

2.Preliminaries:

Definition 2.1:

Let A be a non empty set. A binary operation $*$ on A is a function $* : A \times A \rightarrow A$.The image of an ordered pair (a , b) ϵ A × A under $*$ is denoted by $a * b$. A set A with a binary operation $*$ defined on it is denoted by (A , $*$).In simple ,A binary operation is a "way of putting two things together".

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Detour Global Domination Number of Some Standard And Special Graphs

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Abstract

In this paper, we introduce a new domination parameter, called detour global domination number of a graph. A subset S of V of a connected graph G= (V, E) *is a detour global dominating set if S is both detour set and global dominating set of G. The minimum cardinality taken over all detour global dominating sets is called the detour global domination number of G and is denoted by* $\gamma_{dg}(G)$. *A detour global dominating set of cardinality* γ_{dg} *(G) is called a* γ_{dg}*- set of G. We determine* $\gamma_{dg}(G)$ *for some standard and special graphs and study some general properties for* $\gamma_{dg}(G)$

Keywords: *Detour set, dominating set, detour dominating set, global dominating set, detour global dominating set.*
Mathematical subject classification 05C12, 05C75

1. INTRODUCTION

By a graph G, we mean a finite undirected connected graph without loops or multiple edges. Unless and otherwise stated, the graph G = (V, E) has n = $|V|$ vertices and m = $|E|$ edges. For basic definitions and terminologies, we refer [1,5]. For vertices u and v in a graph G, the detour distance D (u, v) is the length of a longest u – v path in G. A u – v path of length D (u, v) is called a u – v detour. The closed detour interval ID $[u , v]$ consists of u, v and all vertices in some u – v detour of G. These concepts were studied by Chartrand et al. [2,3] For S ⊆ $V(G)$, ID $[S] = \cup_{u,v\in S}$ ID $[u , v]$. A subset S of V of a graph G is called a detour set if ID $[S] = V(G)$.The detour number dn(G) of G is the minimum cardinality taken over all detour sets in G. These concepts were studied by Chartrand [4].

The concepts of domination number and global domination number of a graph were introduced in [7,10]. A subset S of V of a graph G= (V, E) is called a dominating set of G if every vertex in V – S is adjacent to at least one vertex in S. The domination number $\gamma(G)$ of G is the minimum cardinality taken over all dominating sets in G.A subset S of V of a graph G= (V, E) is a detour dominating set of if S is both detour set and dominating set of G. The detour domination number $\gamma_d(G)$ is the minimum cardinality taken over all detour dominating sets in G.

A subset S of V of a graph G= (V, E) is called a global dominating set (g .d. set) if it is a dominating set of a graph G and its complement $\bar{G}$ of G. The global domination number γ_g(G) of G is the minimum cardinality taken over all global dominating sets in G.

Theorem 1.1: Every end vertex of a connected graph G belongs to every detour set of G.

Theorem 1.2: If G is a connected graph of order n ≥ 2, then 2≤ max $\{\gamma(G), dn(G)\}$≤ $\gamma_d(G)$ ≤ n.

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Equitable Triple Connected Two Domination Number of a Graph

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Abstract

The concept of triple connected graphs with real life application was introduced by considering the existence of a path containing any three vertices of a graph G. In this paper we introduce a new domination parameter called equitable triple connected two domination number of a graph. A two dominating set S S of V of a non-trivial graph G is said to be an equitable triple connected two domination set if <S> is triple connected and for every u ϵ V – S there exists a v ϵ S such that uv is an edge of G and $|d(u) - d(v)| \leq 1$. *The minimum cardinality taken over all equitable triple connected two dominating sets is called the equitable triple connected two domination number and is denoted by* γ_{etc2d} *(G). We find the upper and lower bounds and investigate this number for some standard graphs. We also investigate its relationship with other graph theoretical parameters.*

Keywords: *Triple connected graphs, Equitable triple connected two domination number of a graph. Subject Classification: 05C69.*

1. Introduction

The concept of triple connected graphs with real life application was introduced by considering the existence of a path containing any three vertices of a graph G. In this paper we introduce a new domination parameter called equitable triple connected two domination number of a graph. All graphs considered here are finite, undirected without loops and multiple edges. Unless and otherwise stated the graph G = (V, E) considered here have p = $|V|$ vertices and q = $|E|$ edges.

A subset *S* of *V* of a non - trivial graph *G* is called a *dominating set* of *G* if every vertex in *V* – *S* is adjacent to at least one vertex in *S*. The *domination number γ(G)* of *G* is the minimum cardinality taken over all dominating sets in *G*. A subset S of V of a non - trivial graph is said to be a triple connected dominating set, if S is a dominating set and the induced subgraph <S> is triple connected. The minimum cardinality taken over all triple connected dominating sets is called the triple connected domination number and is denoted by γ_{tc} (G). A subset *S* of *V* of a non - trivial graph *G* is said to be two dominating set if every vertex in V – S is adjacent to atleast two vertices in S. The minimum cardinality taken over all two dominating sets is called the two domination number and is denoted by γ_2 (G). A two dominating set S of a non-trivial graph G is said to be an equitable triple connected two dominating set if <S> is triple connected and for every u ϵ V – S there exists a v ϵ S such that uv is an edge of G and $|d(u) - d(v)| \leq 1$. The minimum cardinality taken over all equitable triple connected two dominating sets is called the equitable triple connected two domination number and is denoted by γ_{etc2d} (G).

Theorem 1.1:

A tree is triple connected if and only if T ≅ P_p, p ≥ 3

Theorem 1.2:

For any graph G, $\left\lceil \frac{p}{\Delta + 1} \right\rceil \leq \gamma$ (G)

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VERTEX MAGIC LABELING ON V_4 FOR SOME CYCLE RELATED GRAPHS

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ABSTRACT. Let V_4 be an abelian group under multiplication. Let $g : E(G) \to V_4 - \{1\}$. The vertex magic labeling on V_4 is defined as the vertex labeling $g^* : V(G) \to V_4$ such that $g^*(v) = \prod_u g(uv)$, where the product is taken over all edges uv of G incident at v is a constant . A graph is said to be V_4-magic if it admits a vertex magic labeling on V_4. In this paper we prove that Rafflesia graph , Cycle Flower graph and $S'(C_n)$ graphs are V_4-magic graphs.

1. INTRODUCTION

In 1963, Sedlack introduced Magic labelings. Later Kong, Lee and Sun used the term magic labeling for edge labeling with non negative integers such that for each vertex, the sum of the labels of all edges incident at any vertex v is the same for all the vertices. For a non trivial Abelian group V_4 under multiplication a graph G is said to be V_4-magic graph if there exists a labeling g of the edges of G with non zero elements of V_4 such that the vertex labeling g^* defined as $g^*(v) = \prod_u g(uv)$ taken over all edges uv incident at v is a constant.

Let $V_4 = \{i, -i, -1, 1\}$ we prove that Rafflesia graph, Cycle flower graph and splitting graph are V_4-magic graphs. For further references see [1,2].

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Key words and phrases. Vertex magic labeling on V_4, V_4-magic graphs, Rafflesia Graph.

Propagation in certain nano structures and bloom torus

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Steiner Domination In Line And Jump Fuzzy Graphs

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Abstract—Line graph L(G) of a graph G is acquired by converting the arcs of G into nodes of the L(G) and connecting the nodes of L(G) only if the corresponding arcs are incident with the same node. The jump graph J(G) is the complement of L(G). In this article bounds on steiner domination numbers of line fuzzy graphs and jump fuzzy graphs are obtained.

Keywords : fuzzy steiner domination, line fuzzy graphs, jump fuzzy graphs.
AMS Subject Classification 2010 : 05C72, 05C69, 51E10

1. Introduction

Rosenfeld launched fuzzy graph theory which has its applications in diverse fields. In particular fuzzy topologies are used in circuit designing and fuzzy steiner distance and domination have applications in routing problems. In engineering field steiner trees have applications in network routing, wireless communications and VLSI design. Various fuzzy graph theoretic concepts has been studied from [6] and [7]. In [1] and [2] the authors described about domination in fuzzy graphs. Steiner domination in crisp graphs was studied from [3], [4] and [5]. A steiner set of a fuzzy graph (V, σ, μ) is a set of nodes S such that any node in G lies in some steiner tree of G. A steiner dominating set of G is a set of nodes which is both steiner set as well as dominating set. The minimum fuzzy cardinality of a minimal fuzzy Steiner dominating set is called fuzzy Steiner dominating number denoted by γ^{fs} and the maximum fuzzy cardinality of a minimal fuzzy Steiner dominating set is called upper fuzzy Steiner dominating number denoted by Γ^{fs}. Here we acquire some bounds on steiner domination numbers of line fuzzy graphs and jump fuzzy graphs.

2. Steiner Domination in Line fuzzy and Jump fuzzy graphs

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Steiner Domination In Line And Jump Fuzzy Graphs

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2. Steiner Domination in Line fuzzy and Jump fuzzy graphs

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THE TOTAL TRIANGLE FREE DETOUR NUMBER OF A GRAPH

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ABSTRACT. For a connected graph $G = (V, E)$ and u, v any two vertices in G, a $u - v$ path P is said to be a $u - v$ triangle free path if no three vertices of P induce a cycle C_3 in G. The triangle free detour distance $D_{\Delta f}(u, v)$ is the length of a longest $u - v$ triangle free path in G. A $u - v$ triangle free path of length $D_{\Delta f}(u, v)$ is called the $u - v$ triangle free detour. In this article, the concept of total triangle free detour number of a graph G is introduced. It is found that the total triangle free detour number differs from triangle free detour number and connected triangle free detour number. The total triangle free detour number is found for some standard graphs. Their bounds are determined. Certain general properties satisfied by them are studied.

1. INTRODUCTION

For a graph $G = (V, E)$, we mean a finite undirected connected simple graph. The order of G is represented by n. We consider graphs with at least two vertices. For basic definitions we refer [3]. For vertices u and v in a connected graph G, the detour distance $D(u, v)$ is the length of the longest $u - v$ path in G. A $u - v$ path of length $D(u, v)$ is called a $u - v$ detour. This concept was studied by Chartrand et.al, [1].

A vertex x is said to lie on a $u - v$ detour P if x is a vertex of $u - v$ detour path P including the vertices u and v. A set $S \subseteq V$ is called a detour set if

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2010 *Mathematics Subject Classification.* 05C12.
Key words and phrases. triangle free detour set, triangle free detour number, total triangle free detour set, total triangle free detour number.

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Research Article

Nano Ideal Generalised Closed Sets in Nano Ideal Topological Spaces

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ABSTRACT

The purpose of this paper is to define and study a new class of closed sets called $NIgsemi^*$-closed sets in nano ideal topological spaces. Basic properties of $NIgsemi^*$ - closed sets are analyzed and we compared it with some existing closed sets in nano ideal topological spaces.
Key words:$NIgsemi^*$- closed set, closed sets in nano ideal topology ,$NIgsemi^*$- open set, nano topology.

1. INTRODUCTION

The concept of ideal topological space was introduced by kuratowski [9]. Also he defined the local functions in ideal topological spaces. In 1990, Jankovic and Hamlett [4] investigated further properties of ideal topological spaces. The notion of I-open sets was introduced by Jankovic et al. [5] and it was investigated by Abd El-Monsef [11]. Later, many authors introduced several open sets and generalized open sets in ideal topological spaces such as $pre\ I$-open sets[2], $semi\ I$-open sets [6], α-I-open sets[6] , αg-I-open sets [23] and gp-I-open sets [23].

In 2013, Lellis Thivagar and Carmel Richard[12] established the field of nano topological spaces which was defined in terms of approximations and boundary region of a subset of an universe using an equivalence relation on it and also defined nano closed sets, nano-interior and nano-closure. K.Bhuvaneswari et al. [9] introduced and studied the concept of nano generalised closed sets in nano topological spaces. Later Many researchers like [3],[9] obtained several generalizations of nano open sets. In 2012, Robert et. Al [1,2] introduced the class of $semi^*$-open sets and $semi^*$-closed sets in Topological Spaces. In 2015, Paulraj Gnanachandra [19] introduced the notion of $nano\ semi^*$-open sets and $nano\ semi^*$-closed sets in terms of nano generalised closure and nano generalised interior in Nano Topological Spaces. In 2020 [18], further properties of $nano\ semi^*$-open sets were investigated.

M. Parimala et al. [14, 15, 17] introduced the concept of nano ideal topological spaces and investigated some of its basic properties. In 2018, M.Parimala and Jafari [15] introduced the notion of $nano\ I$-open sets and studied several properties. Further she defined nIg - open sets and nIg- closed sets in Nano Ideal Topological Spaces.

In this paper, we introduce a new type of generalized closed and open sets called $NIgsemi^*$-closed set and $NIgsemi^*$-open set in nano ideal topological spaces and investigate the relationships between this set with other sets in nano topological spaces and nano ideal topological spaces. Characterizations and properties of $NIgsemi^*$ -closed sets and $NIgsemi^*$-open sets are studied.

2. PRELIMINARIES

Throughout this paper $(U, \tau_R(X))$ (or U) represent nano topological spaces on whichno separation axioms are assumed unless otherwise mentioned. For a subset A of a space $(U, \tau_R(X))$, $N\ cl(A)$ and $N\ int(A)$ denote the nano closure of A and the nano interior of A respectively. We recall the following definitions, which will be used in the sequel.

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New Continuous Function In Nano Topological Spaces

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Abstract

The determination of this paper is to introduce the concept of α_{Ng}continuous function in Nano Topological space and derive their characterizations in terms of α_{Ng} closed set, α_{Ng} interior and α_{Ng} closure. Also we relate α_{Ng} continuous maps with other continuous maps.
Keywords *Nano topological space, α_{Ng} continuous, α_{Ng} closed , α_{Ng} interior and α_{Ng} closure.*

1. INTRODUCTION

Continuous function is one of the main concepts of Topology. Balachandran[1] et al. have introduced g-continuous function in topological spaces. The notion of Nano topology was introduced by LellisThivagar[3] which was defined in terms of approximations and boundary region of a subset of an universe using an equivalence relation on it and he also defined Nano closed sets, Nano-interior, Nano-closure and Nano continuous functions.Suganya[5] et al introduced and studied some properties of α_{Ng} open sets in Nano topological spaces. In this paper we have introduced a new class of functions on Nano topological space called α_{Ng} continuous functions and derived their characterizations in terms of α_{Ng}closed sets, α_{Ng}closure and α_{Ng} interior.

2. PRELIMNARIES

Definition 2.1.[5]A subset A of a Nano topological space (U, $\tau_R(X)$) is called α_{Ng}open set if $A \subseteq NgInt(NCl(NgInt(A))$.

Definition 2.2.[3]Let U be a non empty finite set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. Then U is divided into disjoint equivalence classes. Elements belonging to the same equivalence class are said to be discernible with one another. The pair(U,R) is said to be the approximation space. Let X⊆U

1. The lower approximation of X with respect to R is the set of all objects which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$. That is $L_R(X) = \cup_{x\in U}\{R(x) / R(x) \subseteq X\}$ where R(x) denotesthe equivalence class determined by X.
2. The upper approximation of X with respect to R is the set of all objects which can be possibly defined as X with respect to R and it is denoted by $U_R(X)$.That is $U_R(X) = \cup_{x\in U}\{R(x) / R(x) \cap X \neq \phi\}$
3. The boundary region of X with respect to R is the set of all objects which can be classified neither as X nor as not X with respect to R and is denoted by $B_R(X)$. That is $B_R(X) = U_R(X) - L_R(X)$

Property 2.3.[3]If (U, R) is an approximation space and X, Y ⊆ U, then
1. $L_R(X) \subseteq X \subseteq U_R(X)$
2. $L_R(\phi) = U_R(\phi) = \phi$ and $L_R(U) = U_R(U) = U$
3. $U_R(X \cup Y) = U_R(X) \cup U_R(Y)$

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Some New Nearly Open Sets in Nano Topological Spaces

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Abstract
The objective of this paper is to introduce new class of sets namely α_{Ng} open sets and α_{Ng} closed sets in Nanotopological spaces. Alsowedefineα_{Ng} interior and α_{Ng} closureand some of theirbasic properties arediscussed. Additionaly the relationship betweenα_{Ng} open (closed) sets andother Nano open(closed) sets arealso discussed.

Keywords Nano topological space, α_{Ng} open, α_{Ng} closed, α_{Ng} interior and α_{Ng} closure.

I. Introduction

Levine[5] introduced the class of g-closed sets in1970. S. Pious Missier and P. Anbarasi[6] introduced the concept of α^* open sets and discussed some of their basic properties.
M. Lellis Thivagar[3] introduced Nano topological space with respect to a subset X of a universe which is defined in terms of lower and upper approximations of X. He has also defined Nano closed sets, Nano interior and Nano closure of a set. He also introduced the weak forms of Nano open sets. K. Bhuvaneswari and K. Mythili Gnanapriya[1]introduced Nano g- closed sets and obtained some of the basic results. In this paper, we define a new class of sets called α_{Ng} open and α_{Ng} closed sets in the Nano topological space and study the relationships with other Nano sets.

II. Preliminaries

Definition 2.1.[7]A subset A of a topological space (X,τ) is called α^*open if $A \subseteq int^*(cl(int^*(A)))$

Definition 2.2.[6]Let U be a non empty finite set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. Then U is divided into disjoint equivalence classes. Elements belonging to the same equivalence class are said to be discernible with one another. The pair(U,R) is said to be the approximation space. Let X⊆U

1. The lower approximation of X with respect to R is the set of all objects which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$. That is $L_R(X) = {}_{x\in U}\{R(x)\ /R\ x \subseteq X\}$ where R(x) denotes the equivalence class determined by X.
2. The upper approximation of X with respect to R is the set of all objects which can be possibly defined as X with respect to R and it is denoted by $U_R(X)$. That is $U_R(X)= {}_{x\in U}\{R(x)\ /R(x) \cap X \neq \phi\}$
3. The boundary region of X with respect to R is the set of all objects which can be classified neither as X nor as not X with respect to R and is denoted by $B_R(X)$. That is $B_R(X) = U_R(X) - L_R(X)$.

Proposition 2.3.[6]If (U,R) is an approximation space and X, Y ⊆ U, then
1. $L_R(X) \subseteq X \subseteq U_R(X)$
2. $L_R(\phi) = U_R(\phi) = \phi$ and $L_R(U) = U_R(U) = U$
3. $U_R(X \cup Y) = U_R(X) \cup U_R(Y)$

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A New Class Of Nearly Open Sets In Nanotopological Spaces

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Abstract

The aim of this paper is to introduce a new class of sets, namely Nano semi-open sets and Nano semi*-closed sets. Further we define Nano semi*-interior and Nano semi*-closure and discuss its properties. Additionally we relate Nano semi*-open sets and Nano semi*-closed sets with some other sets.*

Keywords *and phrases: Nano semi*-open, Nano semi*-closed, Nano semi*-interior, Nano semi*-closure.*

I. INTRODUCTION

In 1963 Levine[5] introduced semi-open sets in topological spaces. After Levine's work, many mathematicians turned their attention to generalizing various concepts in topology by considering semi-open sets. A.Robert and S. Pious Missier [6] introduced the concept of semi*- open sets and discussed some of their basic properties. Levine [9] defined and studied generalizied closed sets in 1970. Das[2] defined semi-interior point and semi-limit point of a subset.M. LellisThivagar[3] introduced Nano topological space with respect to a subset X of a universe which is defined interms of lower and upper approximations of X. He has also defined Nano closed sets, Nano-interior and Nano-closure of a set. He also introduced the weak forms of Nano open sets. K.Bhuvaneswari and K.MythiliGnanapriya[1] introduced Nano g-closed sets and obtained some of the basic results. In this paper, we define a new class of sets called s^*_N open and s^*_N closed sets in Nano topological space and study the relationships with other Nano sets.

II. PRELIMINARIES

Definition 2.1:A subset A of a topological space (X,τ) is **semi-open [5]** if there is an open set U in X such that $U \subseteq A \subseteq Cl(U)$ or equivalently if $A \subseteq Cl(Int(A))$. The class of all semi-open sets in (X,τ) is denoted by **SO(X,τ)**

Definition 2.2: A subset A is a topological space (X,τ) is **pre-open [7]** (resp. α-open[8]) if A⊆int(cl(A)) (resp. A⊆int(cl(int(A)))).

Definition 2.3: If A of a subset of a space X, the **semi-interior** of A is defined as the union of all semi-open sets of X contained in A. It is denoted by **sInt(A)**

Definition 2.4: A subset A of a space X is **generalized-closed** (briefly g-closed)[9] if Cl(A)⊆U whenever A⊆U and U is open in X.

Definition 2.5: If A is a subset A of a space X, the **generalized-closure** [3] of A is defined as the intersection of all g-closed sets in X containing A and is denoted by Cl*(A).

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NEW NOTIONS IN IDEAL TOPOLOGICAL SPACES

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Abstract:- The aim of this paper is to introduce the notion of Fg closed sets in Ideal Topological Spaces. Several properties and characterizations of Fg closed sets in Ideal topological spaces are discussed.

Keywords— Feebly closed set, Semi closed set , I-closed set , Feebly I-closed set , Semi I closed set, Fg I closed sets.

I.INTRODUCTION

The concept of ideal topology in the classic text was introduced by Kuratowski [6]. D.Jankovie and R Hamlelt [2] introduced the concept of I open set in Ideal Topological Space. After that M.E.Abdel, E.Monsef, F.Iashien and A.A.Nasef [7] introduced a new study about the I open set. S. N. Maheshwari and P. C. Jain [9] introduced the concept of feebly open set and feebly closed set in topological spaces, after that many Authors used the concept of feebly open set and feebly closed sets to study another concepts in Topological Spaces.

N.Ievin [8] introduced the concept of semi open sets and semi closed sets. After that Hatir defined semi open set in Ideal Topological Spaces [3]. Then K. Yiezi Al Talkany and H. Suadud Al Ismael [12] were defined the feebly open set in ideal topological space. In this paper we introduced new notion of closed sets in ideal topological spaces called F_gI closed set. Further we investigated its properties and its characterizations. Throughout this paper (X,τ) or simply X denote topological space on which no separation axioms are assumed unless otherwise explicitly stated.

II. PRELIMINARIES

Definition 2.1[5]

An ideal I on a topological space (X,τ) is a nonempty collection of subsets of X, which satisfies the following two conditions:

(i) If $A \in I$ and $B \subseteq A$ implies $B \in I$
(ii) If $A \in I$ and $B \in I$, then $A \cup B \in I$

Definition 2.2[5]

An ideal topological space is a topological space (X,τ) with an ideal I on X and it is denoted by (X,τ,I). Given a topological space (X,τ) with an ideal I on X and if $\rho(X)$ is the set of all subsets of X, a set operator $(*) : \rho(X) \to \rho(X)$, called a local function of A with respect to τ and I, is defined as follows: for $A \subseteq X$, $A^*(I,\tau) = \{x \in X / U \cap A \notin I$ for every $U \in \tau(x)\}$ where $\tau(x) = \{U \in \tau / x \in U\}$. We simply write A^* instead of $A^*(I,\tau)$.

Definition 2.3

For every Ideal topological space (X, τ, I), there exists a topology $\tau*(I)$, finer than τ, generated by β(I,τ) ={U-i/U ∈τ & i∈ I}. But in general (I,τ) is not always a topology. Additionally $cl^*(A) = A \cup A^*$ defines a kuratowski closure operator for τ^*(I). If $A \subseteq X$, $cl(A)$ and int(A) will, respectively, denote the closure and interior of A in (X,τ) and $int^*(A)$ denote the interior of A in $(X,\tau*)$. A subset A of an ideal space (X,τ,I) is *-closed (resp. *-dense in itself) if $A^* \subseteq A$ (resp. $A \subseteq A^*$).

Definition 2.4 [7]

Given a space (X,τ,I) and $A \subseteq X$, A is said to be I open if $A \subseteq intA^*$. We denoted by $IO(X,\tau) = \{A \subseteq X, A \subseteq int(A^*)\}$ or simply write I.O for IO(X,T) when there is no chance for confusion.

Proposition 2.5[5]

Let (X,τ,I) be an ideal topological space then every closed I open subset A of X is open set.

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Abstract: We introduce a new class of soft contra generalized star beta continuous function (contra $g^*\beta^s$-conts function) in soft topological spaces. Also we present almost contra $g^*\beta^s$-continuous functions and we derive some basic properties.

Keywords and Phrases: Contra $g^*\beta^s$-continuous, almost contra $g^*\beta^s$-continuous, contra $g^*\beta^s$-irresolute.

2020 Mathematics Subject Classification: 54A40, 54C05, 54C10, 54C08.

1. Introduction

Initially the concept of generalized closed sets were introduced by Levine [3] in topological spaces in 1970. Molodtsov [4] pioneered the study of soft set theory as a new mathematical tool and confronted the fundamental results of the soft sets in 1996. Soft topological spaces(STS) are defined over an initial universe with a fixed set of parameters and was introduced by Munazza Naz & Muhammad Shabir [5]. The authors [6, 7] introduced the concept of generalized star β-closed sets in TS and soft $g^*\beta$-closed sets in STS. In this paper we introduced the new concept of contra $g^*\beta^s$-continuous function and contra $g^*\beta^s$-irresolute functions and we have discussed some properties. Also we present almost contra $g^*\beta^s$-continuous functions

A New Set of Soft Generalized*β −Locally Closed Sets in Soft Topological Spaces

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Abstract : We present a new set of soft generalized* β −locally closed set ($here\ after\ mentioned\ as,\ g^*\beta^s - lc$), $soft\ g^*\beta - lc^*$set ($here\ after\ mentioned\ as,\ g^*\beta^s - lc^*$), $soft\ g^*\beta - lc^{**}$ ($here\ after\ mentioned\ as,\ g^*\beta^s - lc^{**}$) sets in STS. Further to the above, the relation between the other notions connected with the forms of $soft - lc$ sets and some properties are studied.

Keyword:$g^*\beta^s$ −closed set, $g^*\beta^s - lc$ set, $g^*\beta^s - lc^*$set,$g^*\beta^s - lc^{**}$set.

AMS Subject Classification (2010): 54A40,54C05,54C08

1. Introduction

Initially the concept of generalized closed sets were introduced by Levine [3] in topological spaces in 1970. Molodtsov [4] pioneered the study of soft set theory as a new mathematical tool and confronted the fundamental results of the soft sets in 1996. Soft set theory has become an important application and it has become a significant tool for dealing with uncertainties integral with the problems in many scientific fields. Soft topological spaces(STS) are defined over an initial universe with a fixed set of parameters and was introduced by MunazzaNaz& Muhammad Shabir [5]. Also in 2015 Kannan [2] introduced soft generalized-locally closed sets in STS. The authors [6,7] introduced the concept of generalized star β-closed sets in TS and soft $g^*\beta$-closed sets in STS.We define $g^*\beta^s - lc$ set, $g^*\beta^s - lc^*$set, $g^*\beta^s - lc^{**}$sets in STS. Also we have introduced the new concept of $g^*\beta^s lc - continuous\ and\ g^*\beta^s lc - irresolute$ functions and we have discussed some properties. The straightforward proof of the theorems is omitted. For the concepts of STS we refer [1,2,6,7,9].

2. Soft $g^*\beta$ −Locally Closed sets

Definition: 2.1 A soft subset $(\mathcal{F}, E)$ of a STS $(\mathcal{U}, \tau, E)$is said to be a soft-$g^*\beta$ −locally closed set (here after called as,$g^*\beta^s - lc$ set) if $(\mathcal{F}, E) = (\mathcal{Q}, E) \cap (S, E)$ where $(\mathcal{Q}, E)$ is $g^*\beta^s$ −open (briefly,$g^*\beta^s O$) and (S, E) is $g^*\beta^s$ −closed set (briefly,$g^*\beta^s \mathcal{C}$).
It is denoted by $g^*\beta^s - lc(\mathcal{U}, \tau, E)$.

Definition: 2.2 A soft subset $(\mathcal{F}, E)$ of a STS $(\mathcal{U}, \tau, E)$is said to be a $g^*\beta^s - lc^*$set if there exists a $g^*\beta^s O$ set $(\mathcal{Q}, E)$ and soft closed (briefly,$\mathcal{C}^s$) set(S, E) of $\mathcal{U}$ such that $(\mathcal{F}, E) = (\mathcal{Q}, E) \cap (S, E)$.
It is denoted by $g^*\beta^s - lc^*(\mathcal{U}, \tau, E)$.

Symmetric bi-interior ideals of Symmetric Semigroups

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Abstract: In this paper, as a further generalization of ideals, we introduce the notion of symmetric bi- interior ideal as a generalization of symmetric quasi ideal, symmetric bi-ideal and symmetric interior ideal of symmetric semigroup and study the properties of symmetric bi-interior ideals of symmetric semigroup and simple symmetric semigroup.

Keywords: symmetric quasi ideal(SQ-ideal), symmetric bi-ideal(Sbi-ideal), symmetric interior ideal(Si-ideal), symmetric bi-interior ideal(Sbii-ideal), symmetric bi-quasi ideal(SbiQ-ideal), bi-interior symmetric semigroup.

1.Introduction

In [3],[6] introduced the concepts of bi-ideals in semigroups. The notion of Quasi-ideals was introduced by [14]for rings and semigroups.

2.Preliminaries

Definition 2.1

Let S be a SSG of (S_3, o).A non empty subset A of S is said to be symmetric left ideal of S if $S \times^{\circ} A \supseteq A$ and A is said to be symmetric right ideal of S if $A \times^{\circ} S \supseteq A$. Similarly S in $(S_3, +^{o})$, symmetric left ideal of S if $S \times^{+o} A \supseteq A$ and A is said to be symmetric right ideal of S if $A \times^{+o} S \supseteq A$. If A is both left and right ideal then it is called an symmetric two sided ideal of S.

Definition 2.2 Simple Symmetric Semigroup:

A symmetric semigroup S is said to be simple symmetric semigroup if S has no proper ideals.

Definition 2.3 symmetric bi-ideal (Sbi-ideal)

A subsemigroup S_1 of a SSG S in (S_3, o) is called a symmetric bi-ideal of S if $S_1 \cap (S \times^{\circ} S_1) = S_1$ Similarly S in $(S_3, +^{o})$, if $S_1 \cap (S \times^{+o} S_1) = S_1$.

Definition 2.4 Symmetric Quasi –ideals (SQ-ideals)

Let S be a SSG of (S_3, o).A non empty subset Q of S is said to be Symmetric Quasi –ideals of S if $(S \times^{\circ} Q) \cap (Q \times^{\circ} S) = S$. Similarly S in $(S_3, +^{o})$, $(S \times^{+o} Q) \cap (Q \times^{+o} S) \subseteq S$.

3.Main Results:

Definition 3.1 symmetric interior-ideal (Si-ideal)

A subsemigroup S_1 of a SSG S in (S_3, o) is called a symmetric interior-ideal of S if $(S_1 \times^{\circ} S) \cap S = S$. Similarly S in $(S_3, +^{o})$, if $(S_1 \times^{+o} S) \cap S \subseteq S$.

Example 3.2

Let the elements of $S_3 = \{e, p_1, p_2, p_3, p_4, p_5\}$. The elements of SSG, $S = \{e, p_1, p_2, p_3\}$
The elements of SSSG ,$S_1 = \{e, p_1, p_2\}$. $S_1 \times^{+o} S = \{e, p_1, p_2\} \times^{+o} \{e, p_1, p_2, p_3\} = \{e, p_1, p_2, p_3\}$,
$(S_1 \times^{+o} S) \cap S = \{e, p_1, p_2, p_3\} \cap \{e, p_1, p_2, p_3\} = S$

Symmetric Prime and Symmetric Semiprime Ideals in Symmetric Semirgroups

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Abstract: In this note we introduce the notion of Symmetric Prime and Symmetric Semiprime ideals in Symmetric Semiroups and we define completely symmetric prime and completely symmetric semiprime ideals also we derive some results based on the above concepts.
Keywords: Symmetric semigroup (SSG)-Ideals, SPr- Ideals, SSPr- Ideals, Product Compo of SSG, CSPr –Ideals, CSSPr-Ideals, C-System, PCC-System, Symmetric Complement Group.

1. Introduction

Prime Ideals play very important role in semigroups and are rooted from prime numbers of the integers.Especially ,it is cornerstone on commutative rings and topological semigroups.In [7],[8],[9] introduced the concept of Symmetric Semirings and Symmetric Semigroups, and symmetric semigroup ideals.Here, we introduce the notion of Symmetric Prime and Symmetric Semiprime ideals in Symmetric Semiroups and we define completely symmetric prime and completely symmetric semiprime ideals also we derive some results based on the above concepts.

2.Preliminaries

We define a new operation in composition mapping on S_3, that is called as plus circle compo, its satisfying the conditions in [8].

Definition 2.1 *(S_3,o)* Symmetric Semigroup

A non empty set S in S_3 together with a binary operation 'o' is called (S_3,o) symmetric Semigroup if 'o' is associative in (S_3,o) that is $eo(p_1op_2) = (eop_1)op_2$ *for some* $e,p_1,p_2\epsilon(S_3,o)$.
Similarly$(S_3\,,\,+^o)$ Symmetric semigroup also satisfies $e+^0(p_1+^0p_2) = (e+^0p_1)+^0p_2$ *for some* $e,p_1,p_2\,\epsilon\,(S_3,+^0)$.

3.Main Results

Definition 3.1 $(S_3\,,o)$& $(S_3\,,\,+^o)$ *–Commutative SSG*

If $p_1\,o\,p_2 = p_2\,op_1$,& if $p_1 +^o p_2 = p_2 +^o p_1$,we say that p_1 and p_2 commute with each other ; if $p_1\,o\,p_2 = p_2\,op_1$ & if $p_1 +^o p_2 = p_2 +^o p_1$ for all elements $p_1 , p_2 \in$ S ,we call S is commutative SSG.

Example 3.2

(i) Let S be a SSG of $(S_3\,,\,+^o)$. The elements of S ={ e, p_1 , p_2}. Then we have

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RESEARCH ARTICLE

Equitable Detour Global Domination Number of a Graph

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ABSTRACT

In this paper, we introduce a new domination parameter, called equitable detour global domination number of a graph. A subset D of V(G) is a detour global dominating set if for every vertex of G is contained in a longest path between any pair of vertices in D and global dominating set. The minimum number of vertices taken over all detour global dominating sets of G is called the detour global domination number of G and is denoted by $\gamma_{dng}(G)$. A detour global dominating set of cardinality$\gamma_{dng}(G)$ is called a γ_{dng}- set of G.A detour global dominating set D of V(G) is called an equitable detour global dominating set if for every vertex $a \in V$ not in D, there exists a vertex $b \in D$ such that $ab$is an edge of Gand$|deg(a) - deg(b)| \leq 1$. The minimum number of vertices taken over all equitable detour global dominating sets of G is called the equitable detour global domination number of G and is denoted by$\gamma^e_{dng}(G)$. We determine γ^e_{dng} for some standard class of graphs and characterize the detour global domination and equitable detour global domination parameters are equal.

Keywords: Detour set, detour global dominating set. equitable detour global dominating set Mathematical subject classification 05C12, 05C70.

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RESEARCH ARTICLE

A New Approaches About Contra $g^{*}\beta$ –Continuous Functions in Topological Spaces

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ABSTRACT

Initially the concept of $g^{*}\beta$-closed sets were introduced by Punitha Tharani. A and Sujitha.H [8] in topological spaces in 2020. Now, we introduce a new sets Contra generalized star beta continuous function (briefly,$Contrag^{*}\beta - continuous\ function$) in topological spaces. Also we present almost contra $g^{*}\beta$-continuous functions and some of its characteristics and several properties are investigated. **Mathematics Subject Classification (2010):** 54A04, 54C08, 54C10.

Keywords: $contra\ g^{*}\beta - continuous$, $almost\ contra\ g^{*}\beta - continuous$, $contra\ g^{*}\beta - irresolute$.

INTRODUCTION

The notion of contra and almost contra was introduced by Dontchev [5] in 1996. Along with him Noiri [6] introduced a new weaker form of functions called contra semi continuous function. Contra pre-continuous functions was introduced by Noiri [7]. In 2004 almost contra pre-continuous function was introduced by Ekici.E [4]. Following this, numerous author presented numerous kinds of new generalizations of contra-continuity, contra semi-continuity,

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ABSTRACT

A subset D of V(G) is a detour global dominating set if for each vertex of G is contained in a longest path between any pair of vertices in D and global dominating set. A detour global dominating set D of V(G) is called an equitable detour global dominating set if for each vertex $a \in V$ not in D, there exists a vertex $b \in D$ such that ab is an edge of G and $|deg(a) - deg(b)| \leq 1$.In this paper, we discuss the detour global domination number and equitable detour global domination number of graphs such as lollipop $L_{n,m}$,Windmill $Wd(n,m)$, Friendship F_n, Jellyfish $J(n,\text{m})$ and subdivision of Jellyfish $S(J(n,m))$.

Mathematical subject classification: 05C12, 05C70

Keywords: Detour global domination number, equitable detour global domination number

INTRODUCTION

By a graph G = (V, E), we consider a finite undirected connected graph without loops or multiple edges. The order and size of G are denoted by n, m respectively. The concept of Detour Global Dominating graphs was introduced in [3]. For underlying definition and results, see references.

Preliminaries

Definitions and Notations 2.1

- A lollipop graph $L_{n,m}$ is the graph obtained by joining K_n to P_m with a bridge.

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Research Paper

A Study on Symmetric Subgroups

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ABSTRACT: *In this note we define symmetric subgroups under the operators composition and plus circle compo.Also we derive some results based on the above concepts.*
KEYWORDS: *Symmetric groups,Symmetric subgroups , Composition ,Plus circle compo.*

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I. INTRODUCTION

In mathematics, the symmetric group on a set is the group consisting of all bijections of the set (all one-to-one and onto functions) from the set to itself with function composition as the group operation. The symmetric group is important to diverse areas of mathematics such as Galois theory, invariant theory, the representation theory of Lie groups, and combinatorics. Cayley's theorem states that every group G is isomorphic to a subgroup of the symmetric group on G.

II. PRELIMINARIES

Definition 2.1:
Let A be a finite set containing n elements. The set of all permutations of A is clearly a group under the composition of functions. This group is called the symmetric group of degree n and is denoted by S_n.
Definition 2.2:
Let G be a group, a subset H of G is called a subgroup of G if H itself is a group under the operation induced by G.
Definition 2.3: (Reverse Composition - O_R)
Let us consider a symmetric group S_2. The elements of S_2 are $\{\binom{1\,2}{1\,2},\binom{1\,2}{2\,1}\} = \{e, p_1\}$
The Reverse Composition is defined as in S_2, $e\, O_R\, p_1 - \binom{1\,2}{1\,2}\ O_R \binom{1\,2}{2\,1}$
The composition mapping is $1 \to 1 \to 2$ here we define the reverse composition mapping as
$1 \to 1 \to 2$ (i e) $2 \to 1$
similarly, $2 \to 2 \to 1$ (i e) $1 \to 2$
$$e\ O_R\, p_1 - \binom{1\,2}{2\,1} = p_1$$
and also $p_1\, O_R\, e = \binom{1\,2}{1\,2}\ O_R\ \binom{1\,2}{2\,1}$
(i e) $1 \to 1 \to 2 \Rightarrow 2 \to 1$
$2 \to 2 \to 1 \Rightarrow 1 \to 2.$
$$p_1\, O_R\, e = \binom{1\,2}{1\,2} = p_1$$
It's clearly O_R is also a binary operation.

Definition 2.4:
We define a new operation in composition mapping on S_3, that is called as plus circle compo,

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V_4-Vertex Magic Labeling for Hypercubes

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Abstract

This article deals with the investigation of V_4-vertex magic labeling on Hypercube, Double edge connected path union of hypercubes, Double edge connected open star of hypercubes and Double edge connected open star of path union of hypercubes.

Keyword: $DEC\ P_mQ_n, DECS(m,Q_n), DEC\ S(m,P_n,Q_n), Q_n$.

AMS subject classification (2010): 05C78

1. Introduction

For a non-trivial abelian group V_4-under multiplication a graph G is said to be V_4- magic graph if there exists a labeling g of the edges of G with non-zero elements of V_4-such that the vertex labeling g^* defined as $g^*(v) = \prod_u g(uv)$ taken over all edges uv incident at v is a constant.

Let V_4={i,-i,1,-1}

This article deals with the investigation of V_4- vertex magic label on Hypercube, Path union of hypercube, Union of Overlapping open star of Hypercube, Overlapping open star of path union of Hypercube.

2. Preliminaries

Definition 2.1: A graph obtained by replacing each vertex of $K_{1,n}$ except the apex vertex by the graph $G_1, G_2, \dots, G_n$ is known as an Open star of graphs which is denoted by $S(G_1, G_2, \dots, G_n)$. If we replace each vertex of $K_{1,n}$ except the apex vertex by a graph G.

(i.e) $G_1 = G_2 = \cdots = G_n$

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(i.e) $G_1 = G_2 = \dots = G_n$

Research Article

Vertex Magic Labeling On V_4 for Cartesian product of two cycles

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Abstract: Let V_4 be an abelian group under multiplication. Let $g: E(G) \to V_4$. Then the vertex magic labeling on V_4 is induced as $g^*: V(G) \to V_4$ such that $g^*(v) = \prod_u g(uv)$ where the product is taken over all edges uv of G incident at v is constant. A graph is said to be V_4 - magic if it admits a vertex magic labeling on V_4. In this paper, we prove that $C_m \times C_n, m \geq 3, n \geq 3$, Generalized fish graph, Double cone graph and four Leaf Clover graph are all V_4 -magic graphs.

Keyword: Vertex magic labeling on V_4, V_4 -magic graph, Four Leaf Clover Graph.

AMS subject classification (2010): 05C78

1. Introduction

For a non-trivial abelian group V_4 under multiplication a graph G is said to be V_4 -magic graph if there exist a labeling g of the edges of G with non-zero elements of V_4 such that the vertex labeling g^* defined as $g^*(v) = \prod_u g(uv)$ taken over all edges uv incident at v is a constant.

Let $V_4 = \{i, -i, 1, -1\}$ we have proved that the Cartesian product of two graphs,Generalized fish graph, Happy graph,Four Leaf Clover Graph are all
V_4 -magic graphs.

2. Basic Definition

Definition: 2.1Cartesian Product of Two graphs

Cartesian product of two graphs G, H is a new graph GH with the vertex set $V \times V$ and two vertices are adjacent in the new graph if and only if either $u = v$and u' is adjacent to v' in H or $u' = v'$ and u is adjacent to v in G.

Definition: 2.2Generalized Fish Graph

The generalized fish graph is defined as the one point union of any even cycle with C_3. It is denoted by $GF(2n, 3)$. It has $2n + 2$ vertices and $2n + 3$ edges.

Theorem: 2.3 Cartesian product of two cycles $C_m \times C_n$ is a V_4-magic graph with $m, n \geq 3$.

Proof:

Let $V(C_m \times C_n) = \{v_j: 1 \leq j \leq m\} \cup \{v_j' : 1 \leq j \leq m\} \cup$

$$\cup \{v_j'' : 1 \leq j \leq m\} \cup \{v_j''': 1 \leq j \leq m\}$$

$$E(C_m \times C_n) = \{v_j v_{j+1}: 1 \leq j \leq m\} \cup \{v_j' v_{j+1}': 1 \leq j \leq m\} \cup$$

$$\cup \{v_j'' v_{j+1}'' : 1 \leq j \leq m\} \cup \{v_j''' v_{j+1}''' : 1 \leq j \leq m\} \cup$$

$$\cup \{v_j v_j' : 1 \leq j \leq m\} \cup \{v_j' v_j'' : 1 \leq j \leq m\} \cup$$

$$\cup \{v_j'' v_j''' : 1 \leq j \leq m\} \cup \{v_j''' v_j: 1 \leq j \leq m\}$$

$$[v_{m+1} = v_1;\ v_{m+1}' = v_1';\ v_{m+1}'' = v_1'';\ v_{m+1}''' = v_1''';\ v_0 = v_m;\ v_0' = v_m';$$
$$v_0'' = v_m''; v_0''' = v_m''']$$

Case 1: Let $m, n \geq 3$ and both are even.

Let us define $g: E(C_m \times C_n) \to \{i, -i, -1\}$ as

$$g(v_j v_{j+1}) = iwhenjisodd\ ;\ 1 \leq j \leq m$$

$$g(v_j v_{j+1}) = -iwhenjiseven\ ;\ 1 \leq j \leq m$$

$$g(v_j' v_{j+1}') = iwhenjisodd\ ;\ 1 \leq j \leq m$$

$$g(v_j' v_{j+1}') = -iwhenjiseven\ ;\ 1 \leq j \leq m$$

$$g(v_j'' v_{j+1}'') = iwhenjisodd\ ;\ 1 \leq j \leq m$$

$$g(v_j'' v_{j+1}'') = -iwhenjiseven\ ;\ 1 \leq j \leq m$$

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FUZZY *s*-DOMINATING ENERGY

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Abstract

The energy of a graph is defined as the sum of the absolute values of eigenvalues of its adjacency matrix. The absolute value of the largest eigenvalue is called the spectral radius of the graph. This article introduces *s*-dominating energy in simple connected crisp graphs and extends the same to connected fuzzy graphs. Also *s*-dominating energy of a complete fuzzy graph is determined and bounds on fuzzy *s*-dominating energy are acquired.

1. Introduction

Eigenvalues and Eigen vectors of matrices have huge real life applications. Steiner domination number in crisp graphs has been studied from [7]. Also domination in fuzzy graphs was studied from [2]. The close relation between eigenvalues of dominating matrix and dominating energy are expounded in [3], [4] and [5]. The different types of energies of fuzzy graphs are explicated in [1] and [8]. These studies lead us to introduce Steiner dominating energy (i.e.) *s*-dominating energy in crisp graphs and is then extended to fuzzy graphs.

2010 Mathematics Subject Classification: 05C72, 05C69, 51E10.

Keywords: fuzzy *s*-dominating matrix, fuzzy *s*-dominating eigen values, fuzzy *s*-dominating spectrum.

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path P is called a u - v square free path if no four vertices of P induce a square. The square free detour distance is the length of a longest u - v square free path in G. A u - v path of length is called a u - vsquare free detour. A subset S of V is called a square freedetour set if every vertex of G lies on a u - v square free detour joining a pair of vertices of S. The square free detour of G is the minimum order of its square free detour sets. A square free detour set S of G is called a minimal square free detour set if no proper subset of S is a square free detour set of G. The upper square free detour numberof G is the maximum cardinality of a minimal square free detour set of G. We introduce the upper connected square free detour number and determine the upper connected square free detour number of certain classes of graphs. Further, we investigate the bounds for it and characterize the graphs which realize these bounds. We show that there is no "Intermediate Value Theorem" for minimal connected square free detour sets.

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Keywords: upper square free detour number; minimal square free detour set; minimal connected square free detour set; upper connected square free detour number.

1 Introduction

By a graph$G = (V, E)$, we mean a finite undirected connected simple graph. For basic definitions and terminologies, we refer to Chartrand et al. [6]. The concept of geodetic number was introduced by Harary et al. [1], [7]. For any vertices u and v in a connected graph G, the distance $d(u, v)$ is the length of the shortest $u - v$ path in G. A $u - v$ path of length $d(u, v)$ is called a $u - v$ geodesic. A set $S \subseteq V$ is called geodetic set of G if every vertex of G lies on a geodesic joining a pair of vertices of S. The geodetic number $g(G)$ of G is the minimum order of its geodetic sets and any geodetic set of order $g(G)$ is called a geodetic basis of G. The concept of detour number was introduced by Chartrand et al. [4], [5]. The detour distance$D(u, v)$is the length of the longest $u - v$ path in G.A $u - v$ path of length $D(u, v)$ is called a u − v detour. A set $S \subseteq V$ is called detour set of G if every

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C_4 Free Detour Center

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ABSTRACT

For every connected graph G, the square free detour distance SFD (u, v) is the length of a longest u- v square free path in G, where u, v are the vertices of G. A u-v square free path of length SFD(u, v) is called the u-v square free detour. It is found that the square free detour distance differs from the distance , monophonic distance and detour distance. The square free detour radius is found for some standard graphs. Their bounds are determined and their sharpness is checked. Certain general properties satisfied by them are studied. Existence of graphs is also found.

1991 Mathematics Subject Classification. 05C12.

Keywords and phrases. Distance, Detour Distance, Square Free Detour Distance.

1. Introduction

Basic definitions are studied from [1], [3] and [5]. when a railway line, pipe line or highway is constructed, the distance between the respective structure and each of the communities to be served is to be minimized. In a social network an edge represents two individuals having a common interest. Thus the centrality have interesting applications in social networks. If we consider a cycle of length 4, the serve can be made only to any two communities or vertices. This motivated us to introduce the square free detour center.

2. C_4 FREE DETOUR CENTER

Definition:2.1

Let G be a connected graph. A vertex's sfd eccentricity in G is defined as sfe(u) = max {SFD(u, v) : v ∈ V (G)}. The formula sfrad(G) = min {sfe(u) : u ∈ V(G)} determines the sfd radius of G. The formula sfdiam(G) = max {sfe(u) : u ∈ V (G)} determines the sfd diameter of G.

Note 1. Every pair of vertices v,w in a tree T are connected by a unique path, therefore $d(v,w) = d_m(v,w) = D_{\Delta f}(v,w) = SFD(u,v) = D(v,w)$. Consequently,

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1. Introduction

For a graph $G = (V,E)$, we mean a finite undirected connected simple graph. The order of G is represented by n. We consider graphs with at least two vertices. For basic definitions we refer [3]. For vertices u and v in a connected graph G, the detour distance $D(u,v)$ is the length of the longest $u - v$ path in G. A $u - v$ path of length $D(u,v)$ is called a $u - v$ detour. This concept was studied by Chartrand et.al [1].

A chord of a path P is an edge joining two non-adjacent vertices of P. A path P is called a monophonic path if it is a chordless path. A longest $x - y$ monophonic path is called an $x - y$ detour monophonic path. A set S of vertices of G is a detour monophonic set of G if each vertex v of G lies on an $x-y$ detour monophonic path for some x and y in S. The minimum cardinality of a detour monophonic set of G is the detour monophonic number of G and is denoted by $dm(G)$. The detour monophonic number of a graph was introduced in [8] and further studied in [7].

A total detour monophonic set of a graph G is a detour monophonic set S such that the subgraph $G[S]$ induced by S has no isolated vertices. The minimum cardinality of a total detour monophonic set of G is the total detour monophonic number of G and is denoted by $dm_t(G)$. A total detour monophonic set of cardinality $dm_t(G)$ is called a dm_t-set of G. These concepts were studied by A. P. Santhakumaran et. al[6].

The concept of triangle free detour distance was introduced by Keerthi Asir and Athisayanathan [4]. A path P is called a triangle free path if no three vertices of P induce a triangle. For vertices u and v in a connected graph G, the triangle free detour distance $D_{\Delta f}(u, v)$ is the length of a longest $u - v$ triangle free path in G. A $u - v$ path of length $D_{\Delta f}(u, v)$ is called a $u - v$ triangle free detour. For any two vertices u and v in a connected graph G, $0 \leq d(u, v) \leq dm(u, v) \leq D_{\Delta f}(u, v) \leq D(u, v) \leq n - 1$.

The triangle free detour eccentricity of a vertex v in a connected graph G is defined by $e_{\Delta f}(v) = \max\{D_{\Delta f}(u,v): u, v \in V\}$. The triangle free detour radius of $G$is defined by $rad_{\Delta f}(G) = \min\{e_{\Delta f}(v): v \in V\}$ and The triangle free detour diameter of $G$is defined by $diam_{\Delta f}(G) = \max\{e_{\Delta f}(v): v \in V\}$

A total triangle free detour set of a graph G is a triangle free detour set S such that the subgraph $G[S]$ induced by S has no isolated vertices. The minimum cardinality of a total triangle free detour set of G is the total triangle free detour number of G. It is denoted by $tdn_{\Delta f}(G)$. A total triangle free detour set of cardinality $tdn_{\Delta f}(G)$ is called $tdn_{\Delta f}$- set of G.

A vertex v of a connected graph G is called a support vertex of G if it is adjacent to an end vertex of G. Two adjacent vertices are referred to as neighbors of each other. The set N(v) of neighbors of a vertex v is called the neighborhood of v. A vertex v of a graph G is called extreme vertex if the subgraph induced by its neighbourhood is complete.The following theorems will be used in the sequel.

Theorem 1.1: Let G be a connected graph of order n, then $2 \leq dn_{\Delta f}(G) \leq tdn_{\Delta f}(G) \leq cdn_{\Delta f}(G) \leq n$.

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graph G with $rad_{□f}(G)$= a and $diam_{□f}(G)$ = b.

Keywords: distance; detour distance; triangle free detour distance; square free detour distance.

1 Introduction

For any vertices u and v in a finite undirected connected simple graph $G = (V, E)$, the distance $d(u, v)$ is the length of the shortest $u - v$ path in G. A $u - v$ path of length $d(u, v)$ is called a $u - v$ geodesic. For a vertex v in a connected graph G, the eccentricity $e(v)$ of v is the distance between v and a vertex farthest from v in G. The minimum eccentricity among the vertices of G is its radius and the maximum eccentricity is its diameter, which are denoted by rad(G) and diam(G) respectively. Two vertices u and v of G are antipodal if $d(u, v) =$ diam(G). This geodesic concept was studied and extended to detour distance by Chartrand et. al. [2-5]. For two vertices u and v in a connected graph G, the detour distance $D(u, v)$ from u to v is defined as the length of a longest $u - v$ path in G. A $u - v$ path of length $D(u, v)$ is called a $u - v$ detour. The detour eccentricity $e_D(v)$ of v is the detour distance between the vertex v and a vertex farthest from v in G. The minimum detour eccentricity among the vertices of G is the detour radius $rad_D(G)$ of G and the maximum detour eccentricity is its detour diameter $diam_D(G)$ of G. This detour concept was further studied by Santhakumaran et. al. [11] For two vertices u and v in a connected graph G, a longest $u - v$ chordless path is called a $u - v$ detour monophonic. This detour monophonic distance was studied by Titus et. al. [10,11]. Further, the triangle free detour distance was introduced and studied by Keerthi Asir, Sethu Ramalingam and Athisayanathan [7-9]. The triangle free detour eccentricity $e_{\Delta f}(u)$ of a vertex u in G is the maximum triangle free detour distance from u to a vertex of G. The square free detour radius, $R_{\Delta f}$ of G is the minimum square free detour eccentricity among the vertices of G, while the triangle free detour diameter, $D_{\Delta f}$ of G is the maximum triangle free detour eccentricity among the vertices of G. In this paper, a similar concept of square free detour distance is introduced and investigated. For basic terminology refer to [1,6].