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Regular Inverse Total Strong (Weak) Edge Domination in Fuzzy Graph

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Abstract: In this paper, the new kind of parameter Inverse total strong (weak) edge domination number in a fuzzy graph is defined and established the parametric conditions. Another new kind of parameter regular Inverse total strong (weak) edge domination number is defined and established the parametric conditions. The properties of Inverse total strong (weak) edge domination number and regular Inverse total strong (weak) edge domination number domination number are discussed.

Key words: Dominating set · Total strong (weak) edge domination set · Inverse total strong (weak) edge domination set · Regular inverse total strong (weak) edge domination set · Regular inverse total strong (weak) edge domination number

INTRODUCTION

The concept of fuzzy graph was proposed by kafmann, from the fuzzy relations introduced by Zadeh. Although, In 1975, Rosenfeld introduced another elaborated concept, including fuzzy vertex and fuzzy edges and several fuzzy analogues of graph theoretic concepts such as paths, cycles, connectedness and etc. In the year 1998, the concept of domination in fuzzy graphs was investigated by A. Somasundaram, S.Somasundaram. In the same year, A.Somasundaram presents the concepts of independent domination, total domination and connected domination of fuzzy graph. In the year 2003, A.Nagoor Gani and P. Vadivel investigated Order and Size in fuzzy graph. In the year 2008, A.Nagoor Gani and K. Radha proposed On Regular Fuzzy graph. In 2010, C.Natarajan and S.K. Ayyasamy introduce the strong (weak) domination in fuzzy graph. In the year 1998, S. Arumugam and S. Velammal introduced edge domination in fuzzy graph. In 2012, P.J.Jayalakshmi et.al introduced total strong (weak) domination in fuzzy graph.

Preliminaries

Definition: A fuzzy graph G = (σ, μ) is a pair of functions σ: V → [0,1] is a fuzzy subset, μ: V × V → [0,1] is a fuzzy relation on the fuzzy subset σ, such that μ(u,v) ≤ σ(u) ∧ σ(v) for all u, v ∈ V.

Definition: A fuzzy graph G = (σ, μ) with the underlying set V, the order of G is defined and denoted by $O(G)=\sum_{u\in V}\sigma(u)$ and size of G is define and denoted by $S(G)=\sum_{u,v\in V}\mu(u,v)$

Definition: Let G = (σ, μ) be a fuzzy graph. The degree of a node is defined as $d(u)=\sum_{v\neq u,v\in V}\mu(u,v)$.

Definition: The strong arcs are said to be adjacent if both arc having at least one end node to be same.

Definition: Let G = (σ, μ) be a fuzzy graph. A set of strong arcs D of E is said to be fuzzy edge dominating set if the edges in E – D is adjacent to at least one arc (edge) in D.

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Definition: The fuzzy edge dominating number $\gamma_e(G)$ is the minimum cardinality of the minimal edge dominating set of G.

Definition: Let G be a fuzzy graph.The neighbourhood of a node v in V is defined by $N(v) = \{ u \in V: \mu(u, v) = \sigma(u) \wedge \sigma(v)\}$. The scalar cardinality of N(v) is the neighbourhood degree of v, which is denoted by $d_N(v)$.

Definition: The effective degree of v is the sum of the membership value of the effective (strong) edge incident on v, denoted by $d_E(v)$.

Definition: Let e_1 and e_2 be any two strong edge of the fuzzy graph G. Then e_1 strongly dominates e_2 (e_2 weakly dominates e_1) if (i) e_1, e_2 are adjacent (ii) $d_N(e_1) \geq d_N(e_2)$.

Definition: Let G be a fuzzy graph. Then $D \subseteq E$ is said to be strong (weak) fuzzy edge dominating set of G if every edge $e \in E - D$ is strongly (weakly) dominated by some edge u in D. We denote a strong (weak) fuzzy edge dominating set by sfed-set (wfed-set).

Definition: The minimum scalar cardinality of a sfed-set (wfed-set) is called strong (weak) fuzzy edge dominating number and it is denoted by $\gamma_{esd}(G)(\gamma_{ewd}(G))$.

Definition: A subset T_e of E is said to be an edge total dominating set in G if for every edge in $E - T_e$ is adjacent to atleast one effective edge in T_e.

Definition: A total strong (weak) dominating set T_e of a fuzzy graph G is called minimal total strong (weak) edge dominating set of G if there does not exist any total strong (weak) edge dominating set of G, whose edge cardinality is less than the cardinality of T_e.

Definition: Let G be a fuzzy graph. The neighbourhood of an edge e_i in E is defined by $N(e_i) = \{ e_j \in E / e_i \;\&\; e_j$ are adjacent and effective edges$\}$. The scalar cardinality of $N(e_i)$ is the neighbourhood edge of e_i, which is denoted by $d_N(e_i)$.

Definition: The effective edge of e_i is the sum of the membership value of the effective edge incident on e_i, denoted by $d_E(e_i)$.

Definition: Let e_i and e_j be any two edges of a fuzzy graph G. Then the edge e_i totally strong dominates the edge e_j (the edge e_j totally weak dominates the edge e_i) if.

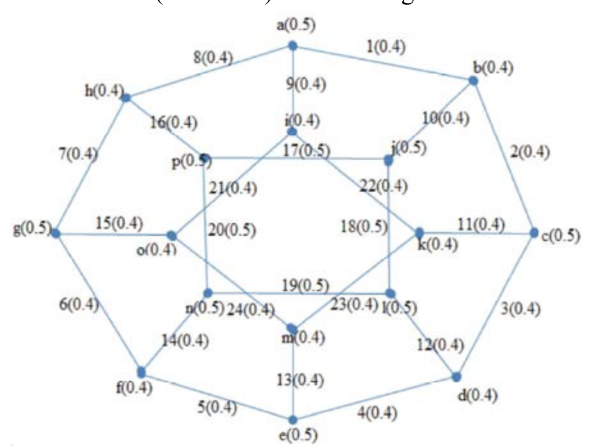
- $d_N(e_i) \geq d_N(e_j)$
- every edge in G dominates e_i.

Definition: Let G be a fuzzy graph. The edge set T_e is said to be a total edge dominating set if for every edge in G dominates atleast one edge of T_e.

Definition: Let G be a fuzzy graph. The edge set T_e is said to be total strong (weak) edge dominating set of G if.

- $d_N(e_i) \geq d_N(e_j)$ for all $e_i \in T_e$, $e_j \in e_i - T_e$
- T_e is a total edge dominating set.

Example (Durer Fuzzy Graph): Let G be a fuzzy graph. $\gamma_T(G)$ be a total strong (weak) domination number in a fuzzy graph. Here, p is a vertex cardinality of G. $\Delta_N(\delta_N)$ be a maximum(minimum) neighbourhood degree of G. $\Delta_E(\delta_E)$ be a maximum(minimum) effective edges in G.



G

Total strong (weak) dominating set, T = {i, j, k, l, m, n, o, p}, V – T = {a, b, c, d, e, f, g, h}

Total strong (weak) domination number, $\gamma_T(G)$, O(G) = p = 7.2 and S(G) = q = 8.8

$\Delta_N(G) = 1.4$, $\delta_N(G) = 1.2$, d(u) = 3.2

Total strong (weak) edge dominating set, Te = {9, 10, 11, 12, 13, 14, 15, 16},

V – Te ={1, 2, 3, 4, 5, 6, 7, 8, 17, 18, 19, 20, 21, 22, 23, 24}

Total strong (weak) edge domination number, $\gamma_{Te}(G)$ 3.2, $\Delta_E(G) = 1.8$, $\delta_E(G) = 1.6$

Inverse Total Strong (Weak) Edge Domination in Fuzzy Graph: In this section, Inverse total strong (weak) edge dominating set of a fuzzy graph is introduced and its parametric conditions are established.

Definition: Let I_{Te} be a minimum total strong (weak) edge dominating set of fuzzy graph G. If $I_{T_e} \subseteq V - I_{T_e}$ is a total strong (weak) edge dominating set of G then I_{Te} is called an inverse total strong (weak) edge dominating set of $\overline{G}$.

Definition: An inverse total strong (weak) edge dominating set I_{Te} of a fuzzy graph G is called minimal inverse total strong (weak) edge dominating set of G, if there does not exist any inverse total strong (weak) edge dominating set of G, whose cardinality is less than the cardinality of I_{Te}.

Definition: The minimum fuzzy cardinality among all minimal inverse total strong (weak) edge dominating set in G is called inverse total strong (weak) edge domination number of G is denoted by $\gamma_{eI_T}{}'(G)$.

Theorem

For a complete fuzzy graph G, $\gamma_{eI_T}{}'(G) \geq \frac{p+1}{2}$.

Proof:

Let G be a fuzzy graph. Let p be a sum all vertex cardinality of G. Here, $\gamma_{I_T}{}'(G)$ be an inverse total strong (weak) edge domination number. $\gamma_{I_T}{}'(G)$ be an inverse total strong (weak) domination number and $\frac{p+1}{2}$ fuzzy vertex cardinality of G. $\frac{p+1}{2}$ is a fuzzy vertex cardinality of G but need not be a maximum fuzzy inverse total strong (weak) edge domination number. Therefore, $\gamma_{eI_T}{}'(G) \geq \frac{p+1}{2}$

Theorem:

For a connected fuzzy graph G, then

$$p - q \leq \gamma_{eI_T}{}'(G) \leq p - \frac{\Delta_e(G)}{2}.$$

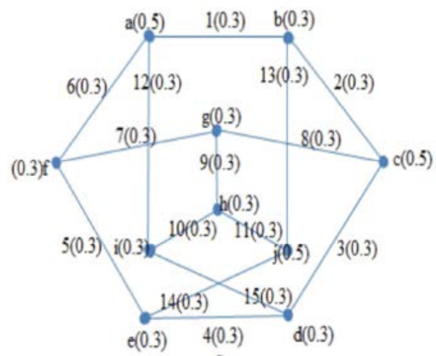
Proof:

Let G be a fuzzy graph. p be a sum of all vertex cardinality of G. q be a sum of all effective edges incident in G. $\Delta_{eN}(G)$ be a maximum neighbourhood of effective edges incident in G. $\gamma_{IT}(G)$ be an inverse total strong (weak) domination number.

p – q is inverse total strong (weak) edge domination number of G and $\gamma_{eI_T}{}'(G)$ be a inverse total strong (weak) edge domination number of G. Inverse total strong (weak) edge domination number of G but need not be minimum inverse total strong (weak) edge dominating set of G. Therefore, $p - q \leq \gamma_{eI_T}{}'(G)$ and Inverse total strong (weak) edge dominating set of G but need not be maximum of $p - \frac{\Delta_e(G)}{2}$. Therefore, $\gamma_{eI_T}{}'(G) \leq p - \frac{\Delta_e(G)}{2}$.

Hence, $p - q \leq \gamma_{eI_T}{}'(G) \leq p - \frac{\Delta_e(G)}{2}$.

Example (Petersen Fuzzy Graph): Let G be a fuzzy graph. p be a sum of all vertex cardinality of G. q be a sum of all effective edges incident in G. $\Delta_{eN}(G)$ be a maximum neighbourhood of effective edges incident in G. $\gamma_{IT}(G)$ be a inverse total strong (weak) edge domination number.



G

I_{te} = { 1, 4, 9}, E – I_{Te} = { 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}, $I_{Te}{}'$ = {2, 5, 10} ⊆ E - I_{Te}, $\gamma_{eIT}(G) = 0.9$, $\gamma_{eIT}{}'(G) = 0.9$,

p – q = 0.9, Δ_{eN} (G) = 1.2, $\delta_{eN}(G) = 1.2$.
p – $\Delta_{eN}(G)$ = 2.4, p– $\delta_{eN}(G)$ = 2.4,
q – Δ_{eN}, (G) = 3.3, q – $\delta_{eN}(G)$ = 3.3, p = 3 .6, q = 4.5.

Regular Total Strong (Weak) Edge Domination in Fuzzy Graph: In this section, Regular total strong (weak) edge dominating number of fuzzy graph is introduced and its parametric conditions are established.

Definition: A total strong (weak) edge dominating set R_{Te} of a graph G is a regular total strong (weak) edge dominating set if all the edges have same degree.

Definition: A regular total strong (weak) edge dominating set R_{Te} of a fuzzy graph G is called minimal regular total strong (weak) edge dominating set of G, if there does not exist any regular total strong (weak) edge dominating set of G, whose cardinality is less than the cardinality of R_{Te}.

Definition: The minimum fuzzy cardinality among all minimal total strong (weak) edge dominating set G is called minimum regular total strong (weak) edge dominating set of G and its regular total strong (weak) edge domination number is denoted by γ_{eRT} (G).

Theorem:

For a fuzzy graph, $\gamma_{eR_T}(G) \le p - \Delta_{eN}(G) \le p - \delta_{eN}(G)$

Proof

Let G be a fuzzy graph. p be a sum of all vertex cardinality. q be a sum of all effective edges incident in G. Δ_{eN} be a maximum neighbourhood of effective edges incident in G. δ_{eN} be a minimum neighbourhood of effective edges incident in G. γ_{eRT} be a regular total strong (weak) edge domination number of G.

γ_{eRT} a regular total strong (weak) domination number of G and $p - \Delta_{eN}$ (G) be a regular total strong (weak) edge dominating set of G. $p - \Delta_{eN}$(G.) is regular total strong (weak) dominating set of G but need not be minimum regular total strong (weak) edge domination number of G, therefore, $\gamma_{eRT}(G) \le p - \Delta_{eN}(G)$. $p - \delta_{eN}$ (G) is regular total strong (weak) edge domination graph of G but need be minimum regular total strong (weak) edge domination graph of G. Therefore, $p - \Delta_{eN}(G) \le p - \delta_{eN}(G)$.

Hence, $\gamma_{eR_T}(G) \le p - \Delta_{eN}(G) \le p - \delta_{eN}(G)$.

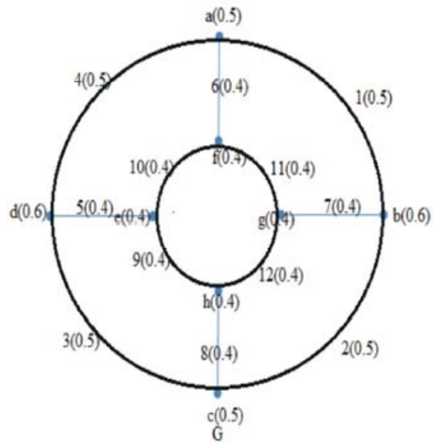
Theorem

For a fuzzy graph, $\gamma_{eR_T}(G) \ge \frac{q - \Delta_{eN}(G)}{\Delta_{eN}(G)+1}$

Proof

Let G be a fuzzy graph. p be a sum of all vertex cardinality. q be a sum of all effective edges incident in G. Δ_{eN} be a maximum neighbourhood of effective edges incident in G. δ_{eN} be a minimum neighbourhood of effective edges incident in G. γ_{eRT} be a regular total strong (weak) edge domination number of G. $\frac{q - \Delta_{eN}(G)}{\Delta_{eN}(G)+1}$ is a regular total strong (weak) edge domination fuzzy graph is need not be minimum regular total strong (weak) edge dominating set of G. Therefore, $\gamma_{eR_T}(G) \ge \frac{q - \Delta_{eN}(G)}{\Delta_{eN}(G)+1}$.

Example (Circular Ladder Fuzzy Graph): Let G be a fuzzy graph. p be a sum of all vertex cardinality. q be a sum of all effective edges incident in G. Δ_{eN} be a maximum neighbourhood of effective edges incident in G. δ_{eN} be a minimum neighbourhood of effective edges incident in G. γ_{eRT} be a regular total strong (weak) edge domination number of G.



G

$R_{te} = \{1, 3, 5, 7\}$, $E - R_{Te} = \{2, 4, 6, 8, 9, 10, 11, 12\}$, p = 4.2, q = 5.2, γ_{eRT} (G) = 1.8

Δ_{eN} (G) = 1.8, δ_{eN} (G) = 1.6, |p – q| = |-1|=1,
$p - \Delta_{eN}$ (G) = 2.4, $p - \delta_{eN}$ (G) = 2.6,
$q - \Delta_{eN}$ (G) = 3.4, $q - \delta_{eN}$ (G) = 3.6.

Regular Inverse Total Strong (Weak) Edge Domination in Fuzzy Graph: In this section, Regular inverse total strong (weak) edge dominating set of fuzzy graph is introduced and its parametric conditions are established.

Definition: Let G be a fuzzy graph. Let RI_{Te} be a inverse total strong (weak) edge dominating set then RI_{Te} is said to be regular inverse total strong (weak) edge dominating set, if all the edges have same degree.

Definition: A regular inverse total strong (weak) edge dominating set RI_{Te} of a fuzzy graph G is called minimal regular inverse total strong (weak) edge dominating set of G, if there does not exist any regular inverse total strong (weak) edge dominating set of G, whose cardinality is less than the cardinality of RI_{Te}.

Definition: The minimum fuzzy cardinality among all minimal regular inverse total strong (weak) edge dominating set G is called minimum regular inverse total strong (weak) edge dominating set of G and its regular inverse total strong (weak) edge domination number is denoted by γ_{eRT}(G).

Theorem

In a fuzzy graph,
$|p - q| \le \gamma_{eRT}(G) \le p - \Delta_{eN}(G) \le p - \delta_{eN}(G)$

Proof

Let G be a fuzzy graph. p be vertex cardinality of G. q be effective edges incident in G. $\Delta_{eN}(G)$ be a maximum neighbourhood of effective edges incident in G. $\delta_{eN}(G)$ be a minimum neighbourhood of effective edges incident in G. $\gamma_{RIT}(G)$ be a regular inverse total strong (weak) edge domination number.

$|p - q|$ is regular inverse total strong (weak) edge dominating set but need not be minimum regular inverse total strong (weak) edge domination number of G. Therefore, $|p - q| \leq \gamma_{eRIT}$ be a regular total strong (weak) edge domination number of G and $p - \Delta_{eN}$ be a regular total strong (weak) edge domination fuzzy graph of G. γ_{eRIT} is a regular inverse total strong (weak) edge domination number but need not be minimum of $p - \Delta_{eN}(G)$. Therefore, $p - \delta_{eN}(G)$ is a regular inverse total strong (weak) edge domination of fuzzy graph but need not be minimum of $p - \Delta_{eN}(G)$.

Therefore, $p - \Delta_{eN}(G) \leq p - \delta_{eN}(G)$.

Hence, $|p-q| \leq \gamma_{eRIT}(G) \leq p - \Delta_{eN}(G) \leq p - \delta_{eN}(G)$

Theorem

In a fuzzy graph,

$|p-q| \leq \gamma_{eRIT}(G) \leq q - \Delta_{eN}(G) \leq q - \delta_{eN}(G)$

Proof

Let G be a fuzzy graph. p be a sum of all vertex cardinality of G. q be a sum of all effective edges incident in G. $\Delta_{eN}(G)$ be a maximum neighbourhood of effective edges incident in G. $\Delta_{eN}(G)$ be a minimum neighbourhood of effective edges incident in G. $\gamma_{RIT}(G)$ be a regular inverse total strong (weak) edge domination number.

$|p - q|$ is regular inverse total strong (weak) edge dominating set but need not be minimum regular inverse total strong (weak) edge domination number of G. Therefore, $|p-q| \leq \gamma_{eRIT}(G)$. $\gamma_{eRIT}(G)$ be a regular inverse total strong (weak) edge domination number of G and $p - \Delta_{eN}(G)$ be a regular inverse total strong (weak) edge domination fuzzy graph of G. $\gamma_{eRIT}(G)$ is a regular inverse total strong (weak) edge domination number but need not be minimum of $p - \Delta_{eN}(G)$. Therefore, $p-\delta_{eN}(G)$ is a regular inverse total strong (weak) edge domination of fuzzy graph but need not be minimum of $p-\Delta_{eN}$ Therefore, $p-\Delta_{eN}(G) \leq p-\delta_{eN}(G)$.

Hence, $|p - q| \leq \gamma_{eRIT}(G) \leq q - \Delta_{eN}(G) \leq q - \delta_{eN}(G)$

Theorem

For a fuzzy graph, $\gamma_{eT}(G) \leq \gamma_{eRIT}(G) \leq \gamma_f(G) \leq p$.

Proof

Let G be a fuzzy graph. Let p be a sum of all vertex cardinality of G. γ_{eT} be a total strong (weak) edge domination number of a fuzzy graph. γ_{eRIT} be a regular inverse total strong (weak) edge domination number. γ_f be a domination number of a fuzzy graph.

γ_{eRIT} be a regular inverse total strong (weak) edge domination number but need not be minimum of a total strong (weak) edge domination number of G therefore, $\gamma_{eT}(G) \leq \gamma_{eRIT}(G)$. $\gamma_f(G)$ domination number of a fuzzy graph need not be a minimum of regular inverse total strong (weak) edge domination number of G, therefore, $\gamma_{eRIT}(G) \leq \gamma_f(G)$. Vertex cardinality of regular inverse total strong (weak) edge domination in G need not be minimum of domination number of a fuzzy graph G. Then $\gamma_f(G) \leq p$. Hence, $\gamma_{eT}(G) \leq \gamma_{eRIT}(G) \leq \gamma_f(G) \leq p$.

Theorem

For a connected fuzzy graph G, then

$$p - q \leq \gamma_{eRI_T}(G) \leq p - \frac{\Delta eRI_T(G)}{2}.$$

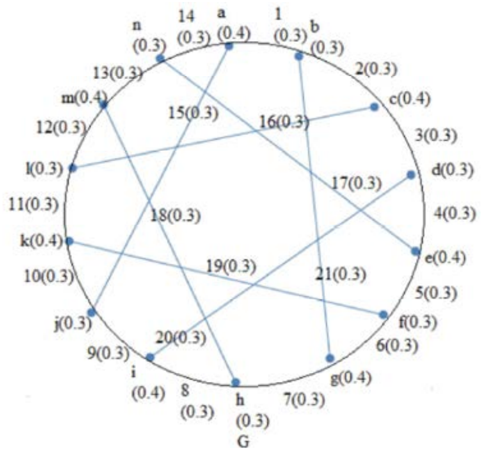
Proof

Let G be a fuzzy graph. p be a sum of all vertex cardinality of G. q be a sum of all effective edges incident in G. Δ_{eRIT} be a regular inverse total strong (weak) edge domination in maximum neighbourhood of effective edges incident in G. γ_{eRIT} be a regular inverse total strong (weak) edge domination number.

Regular inverse total strong (weak) edge domination fuzzy graph G but need not be minimum of $p - q$ is regular inverse total strong (weak) edge domination number of fuzzy graph Therefore, $p - q \leq \gamma_{eRIT}(G)$ and $p - \frac{\Delta eRI_T(G)}{2}$ be a regular inverse total strong (weak) edge domination fuzzy graph G but need not be a minimum regular inverse total strong (weak) edge domination number of G. Therefore, $\gamma_{eRI_T}(G) \leq p - \frac{\Delta eRI_T(G)}{2}$.

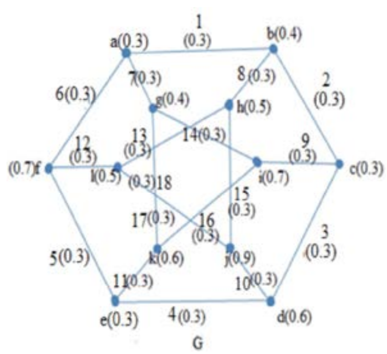
Hence, $p - q \leq \gamma_{eRI_T}(G) \leq p - \frac{\Delta eRI_T(G)}{2}$.

Example (Heawood Fuzzy Graph): Let G be a fuzzy graph. Let p be a sum of all vertex cardinality of G. q be a sum of all effective edges incident in G. $\Delta_{eN}(G)$ be a maximum neighbourhood of effective edges incident in G. γ_{RIT} be a regular inverse total strong (weak) edge domination number.



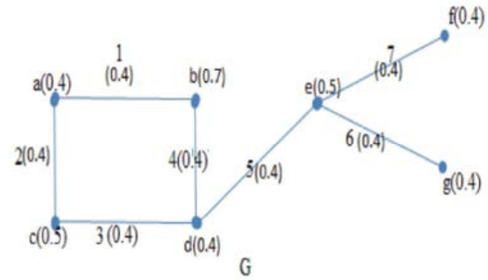
RI_{Te} = {1, 3, 5, 7, 9, 11, 13},
E - RI_{Te} = {2, 4, 6, 8, 10, 12, 14, 15, 16, 17, 18, 19, 20, 21}, p = 4.7, q = 6.3, |p – q | = |-1.6| = 1.6, γ_{eRIT}(G) = 2.1, Δ_{eN}(G) = 1.2, δ_{eN} (G) = 1.2, p – Δ_{eN}(G) = 3.5, p – δ_{eN}(G) = 3.5, q – Δ_{eN}(G) = 5.1, q – δ_{eN}(G) = 5.1. All RI_{Te} edges have same degree.

Example (Durer Fuzzy Graph): Let G be a fuzzy graph. p be a sum of all vertex cardinality of G. q be a sum of all effective edges incident in G. Δ_{eN}(G) be a maximum neighbourhood of effective edges incident in G. γ_{RIT} be a regular inverse total strong (weak) edge domination number.



RI_{Te} = {7, 8, 9, 10, 11, 12},
E - RI_{Te} = {1, 2, 3, 5, 6, 13, 14, 15, 16, 17, 18},
p = 6.2, q = 5.4, |p – q | = |0.8| , γ_{eRIT}(G) = 1.8, Δ_{eN}(G) = 1.2, δ_{eN} (G) = 1.2, p – Δ_{eN}(G) = 5, p – δ_{eN}(G) = 5, q – Δ_{eN}(G) = 4.2, q – δ_{eN}(G) = 4.2.
All RI_{Te} edges have same degree.

Example: Let G be a fuzzy graph. p be a sum of all vertex cardinality of G. q be a sum of all effective edges incident in G. Δ_{eN}(G) be a maximum neighbourhood of effective edges incident in G. γ_{RIT} be a regular inverse total strong (weak) edge domination number.



RI_{Te} = {1, 5}, E - RI_{Te} = {2, 3, 4, 6, 7}, p = 3.3, q = 2.8, |p – q | = |0.5| , γ_{eRIT}(G) = 0.8, Δ_{eN}(G) = 1.2, δ_{eN} (G) = 0.8, p – Δ_{eN}(G) = 2.1, p – δ_{eN}(G) = 2.5, q – Δ_{eN}(G) = 1.6, q – δ_{eN}(G) = 2.
All RI_{Te} edges have same degree.

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REFERENCES

1. Kaufmann, A., 1975. Introduction to the theory of fuzzy subsets, Academic Press, New York.
2. Zadeh, L.A., XXXX. Fuzzy Sets, Information Sciences, 8(965): 338-353.
3. Rosenfeld, A., 1975. Fuzzy Graphs, In Fuzzy sets and Their Applications to Cognitive and Decision process, Academic Press, New York, pp: 77-95.
4. Somasundaram, A. and S. Somasundaram, 1998. Domination in fuzzy graphs-I, Pattern recognition Letters, 19: 787-791.
5. Somasundaram, A., 2004. Domination in Fuzzy graph - II, Journal of Fuzzy Mathematics, pp: 20.
6. Nagoor Gani, A. and M. Basheer Ahamed, 2003. Order and Size in fuzzy graph, Bulletin of pure and Applied Sciences, 1: 145-148.
7. Ayyasamy, S. and C. Natarajan, 2010. Strong (weak) domination in Fuzzy graphs, International Journal of computational and Mathemtaical Secince.
8. Nagoor Gani, A. and K. Radha, 2008. On Regular Fuzzy graph, Journal Physical Sciences, 12: 33-40.
9. Natarajan and S.K. Ayyaswamy, 2010. On Strong(Weak) domination in Fuzzy graphs, World Academy of Science, Engineering and Technology, 4: 07-24.
10. Arumugam, S. and S. Velammal, 1998. Edge domiantion in graphs, Taiwanese Journal of Mathematics, 1998/6/1 - (173-179).

11. Jayalakshmi, P.J., S. Revathi and C.V.R. Hari Narayanan, XXXX. Independent and Total strong (weak) domination in fuzzy graph, International Journal of Computational Engineering Research, Vol, 04/Issue 1.
12. Nagoor Gani, A. and K. Prasanna Devi, 2014. Inverse edge domintion in fuzzy graphs, Advances in Fuzzy sets and Systems, 18(2): 87-100.
13. Ravi Narayanan, S. and R. Raman, 2014. Regular Domination in Fuzzy Graphs, International Journal of Mathematical Archive, 5(12): 147-150.