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A Novel on Fuzzy Intrinsic Edge Conjury Graphs

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ABSTRACT

The paper presents an idea of fuzzy intrinsic edge conjury graphs along with its edge-conjury. In addition to that, discussion on fuzzy paths and fuzzy star graphs of intrinsic edge conjury labeling graphs cycles are given. Theorems based on them have also been provided. The necessary and sufficient conditions related to the above said theorems have also been provided.

Keywords: Fuzzy intrinsic edge-conjury graphs, Path graph, Star Graph

1. Introduction

An introduction of the Fuzzy set has been first given by [1]. The concepts involved in the development of the Fuzzy sets theory have been given by [7] and [15]. The notion of connectivity of fuzzy cut nodes with the fuzzy bridge has been established by [10] in the year 1987. The generalization of crisp graphs shows that many similar properties of a fuzzy graph and crisp graphs are similar. Still, the divergence of crisp graphs is found in many areas. It includes a function $\rho: V \cup E \rightarrow N$ which is bijective and also it has produced a positive integer which is also unique and is termed labeling [8]. The notion of the magic graph has been introduced. The extension of the concepts involved in a magic graph using the additional property which means 'the vertices always get smaller labels than edges' is named super edge conjury labeling. The diverse type of various magic graphs has been explored by various authors [2,3],[5-6],[9],[11-13],[16-18]. The research work done by Kotzig and Rosa has laid the foundation for magic valuations of graphs [4]. The types of labeling are at present known as edge conjury total labeling or edge conjury labeling. Pair of vertices may either be related no not be related to each other in a graph. Either zero or one is the degree of relationship. Concerning fuzzy graph, it takes any values from [0,1]. In various fields, in finding the solution to uncertain problems, fuzzy graphs are used. Such graphs were initially introduced by Kaufmann in the year 1973. The development in framing the structure of fuzzy graphs and the analogs for various concepts based on theory has been done. Nagoor Gani et. al. has made an introduction to various concepts of fuzzy labeling graphs and fuzzy magic graphs. This paper provides the development of the various concept of fuzzy intrinsic edge conjury graphs is given. Also, some of the general forms of edge-conjury persistent in the above said graphs are discussed. It is to be noted that undirected fuzzy graphs have been taken into consideration for this work.

2. Fuzzy Conjury Graph

Definition 2.1.

$a : V \rightarrow [0,1]$ together with $b : V \cdot V \rightarrow [0,1]$ are considered to be two functions. Then a fuzzy graph is one satisfying $a(u) \Lambda a(v) \geq b(u,v)$.

Definition 2.2.

Various different nodes $v_1, v_2, v_3, \ldots v_n$ forming a sequence, which satisfy the condition $b(v_i, v_{i+1}) > 0; 1 \leq i \leq n$ is defined to be the path of fuzzy graph. Its length is $n \geq 1$. Also the edge for the referred path is found to be the pair of consecutive nodes.

Definition 2.3.

Consider a cycle which is defined by a path having greater than one weakest arc. Then it is referred to as a fuzzy cycle where $v_1 = v_n$ in addition to $3 \leq n$.

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3. Fuzzy intrinsic edge magic graphs

Consider a bijective function defined from a: V →[0,1] and b: V · V →[0,1] A fuzzy labeling graph G gets changed to fuzzy intrinsic labeling when the condition that membership values of both the edges and vertices are { q, 2q, 3q,..., Sq }where it is not repeated and S is assumed to be the total number of vertices and edges. Also let $q = 0.1$ for $S \leq 6$ together with $q = 0.01$ for $6 < S$.

Definition 3.1.

A labelling of edge-conjury is defined using fuzzy intrinsic labeling whenever the intrinsic constant $\lambda_c = a(v_i) + b(v_iv_j) + a(v_j)$ for all $v_i, v_j \in V$.

Definition 3.2.

A fuzzy graph G is found to be identified as intrinsic edge-conjury when the intrinsic edge-conjury labeling is done using the intrinsic constant ‘ λ_c’.

Theorem 3.3.

A path Pn is fuzzy intrinsic edge-conjury if $2 \leq n$ where n is the length of P_n.

Proof: Consider P_n to be a fuzzy path graph containing ‘n’ vertices together with ‘n-1’ edges.

Let $q \rightarrow (0,1]$ be such that for $q = 0.1$ for $6 \geq S$ & $q = 0.01$ for $6 < S$.

The fuzzy intrinsic edge- conjury labeling of given path P_n is:

$A(v_{2i}) = (2n-r)q$

$A(v_{2i-1}) = (n+2-r)q$

$B(v_iv_{i+1}) = rq$, for $1 \leq r \leq S$

We can consider the above labelling, we gets fuzzy intrinsic constant.

$\lambda_c = a(v_{2i}) + b(v_iv_j) + a(v_{2i-1})$

$= (2n-r)q+(n+2-r)q+rq$

$= (3n+2-r)q, 1 \leq r \leq S$

Case(i): If n = 3, then the fuzzy intrinsic constant,

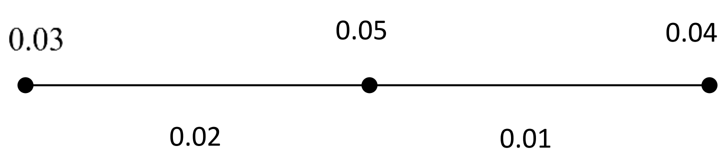

Fig 1. P_3 Graph

$a(v_1) + b(v_1v_2) + a(v_2) = 0.1$

$a(v_2) + b(v_2v_3) + a(v_3) = 0.1$

Case(ii): If n = 4, then the fuzzy intrinsic constant,

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Fig 2. P_4 Graph
$a(v_1) + b(v_1v_2) + a(v_2) = 0.13$

$a(v_2) + b(v_2v_3) + a(v_3) = 0.13$

$a(v_3) + b(v_3v_4) + a(v_4) = 0.13$

For different values of ‘r’ depending upon ‘n’, we get a fuzzy intrinsic edge-conjury constant. Also a fuzzy path P_n admits a fuzzy intrinsic edge-conjury labeling. Hence fuzzy paths with two or more vertices are fuzzy intrinsic edge-conjury graphs with a fuzzy intrinsic edge–conjury constant: $\lambda(P_n) = (3n + 2 - r)q$ for $1 \le r \le S$.

4. Star Graph

Theorem 4.1.

for $n \ge 2$, a fuzzy star $s_{1,n}$ is a fuzzy conjury graph.

Proof: Fuzzy conjury labeling for $s_{1,n}$ is outlined as follow

$a(v) = (f+1)d$ for v in V

$a(u_i) = a(v) + ir$ where $1 \le r \le n$

$b(vu_i) = a(v) - ir$ where $1 \le r \le n$

If $c = \sum_{j=0}^{k-1} (10^j - 1)$,

$D = \sum_{j=0}^{k-1} 10^j$ and k = Range of digits in n (i.e., if $1 \le n \le 9$ => k=1, $10 \le n \le 99$ => k = 2, $100 \le n \le 999$ => k = 3 and so on) then

R= $\{10^{-1}$, $n = 2$ 10^{-2} , $3 \le n \le 9$ 10^{-k}, $10^{k-1} \le n \le c$ $10^{-(k+1)}$, $d \le n \le 10^k - 1$

Thus, the fuzzy conjury constant is

$\lambda(G) = a(u) + b(vu_i) + a(v)$

$= (f+1)r + a(v) - ir + a(v) + ir$

$= (f+1)r + (f+1)r + (f+1)r$

$= 3(f+1)r$.

5. Conclusion

In the process of solving uncertain problems, Fuzzy graph theory can be used. It is also used to model real-time systems which have uncertainty at various levels. These models aim to reduce errors in real-time which cannot be done by customary models. These models are used in various fields of social sciences and engineering. They are applied in intelligent systems. The term fuzzy conjury graphs with fuzzy conjury constant has been introduced here. In addition to that, it is proved that families of fuzzy graphs are fuzzy conjury graphs too.

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