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Geometric Mean 4 Square E Cordial Labeling

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Abstract: Let G(V,E) be a simple graph and let $f: E(G) \to \{1,2,3,4\}$ be a mapping with the induced labeling $f^{*}: V(G) \to \{0,1\}$ defined by $f^{*}(u) = \left\lceil \sqrt[n]{\prod f(uv)^2} \,/ uv \in E(G) \right\rceil$ (mod 2) where $uv \in E(G)$then f is called a geometric mean 4-square E cordial labeling if $|v_f(0) - v_f(1)| \leq 1$ and $|e_f(i) - e_f(j)| \leq 1$ where $v_f(0)$ and $v_f(1)$ is the number of vertices labeled with 0 and labeled by 1 and $e_f(i)$ and $e_f(j)$ is the number of edges labeled with i and labeled by j respectively. A graph which admits a geometric mean 4-square E cordial labeling is called a geometric mean 4-square E cordial graph. In this paper some general are shown are 4-square sum E cordial graph.

Keywords: 4-square sum, E cordial labeling, geometric mean

Mathematical subject classification: 05C78.

1. Introduction

We begin with finite, connected and undirected graph without loops and multiple edges. For any notation and terminology we refer[1]. A graph labeling is an assignment of integer of the vertices of edges or both subject to certain conditions. If the domain of the mapping is the set of vertices or edges then the labeling is called a vertex labeling a and edge labeling. For an edge e=uv, the induced edge labeling

$f^*: E(G) \to \{0,1\}$ is given by $f^*(e = vu) = |f(u) - f(v)|$then $v_f(i)$ is the number of vertices of G having label i under f and $e_f(i)$ is the number of edges of G having label i under f under $f^*$for i=0,1.

A binary vertex labeling of a graph G is called cordial labeling if $|v_f(0) - v_f(1)| \leq 1$ and$|e_f(0) - e_f(1)| \leq 1$. A graph G is called cordial if it admits cordial labeling. The concept of cordial labeling by introduced by Cahit [2].Let G be a graph with vertex set V(G) and edge set E(G) and $f: E(G) \to \{0,1\}$ define f^* on V(G) by $f^*(v) = \sum\{f(uv)/uv \in E(G)\}$ (mod2). The function f is called E cordial labeling of G if $|v_f(0) - v_f(1)| \leq 1$and $|e_f(0) - e_f(1)| \leq 1$. A graph is called E- cordial if it admits E cordial labeling. The concept of E cordial labeling was introduced by Yilmaz and Cahit [3] in 1997. In this paper we introduce a new cordial labeling called geometric mean 4-square e cordial labeling and here some general like complete graph, star, path, cycle, combo graph are shown are geometric mean 4-square e cordial graph.

Geometric mean 4 square E cordial labeling

Definition :

Let G(V,E) be a simple graph and let $f: E(G) \to \{1,2,3,4\}$ be a mapping with the induced labeling $f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2} / uv \in E(G) \right\rceil$ (mod 2) where $uv \in E(G)$then f is called a geometric mean 4-square e cordial labeling if $|v_f(0) - v_f(1)| \leq 1$ and $|e_f(i) - e_f(j)| \leq 1$ where $v_f(0)$ and $v_f(1)$ is the number of vertices labeled with 0 and labeled by 1 and $e_f(i)$ and $e_f(j)$ is the number of edges labeled with i and labeled by j respectively. A graph which admits a geometric mean 4-square e cordial labeling is called a geometric mean 4-square e cordial graph.

Example : Consider $D_2(5C_3)$

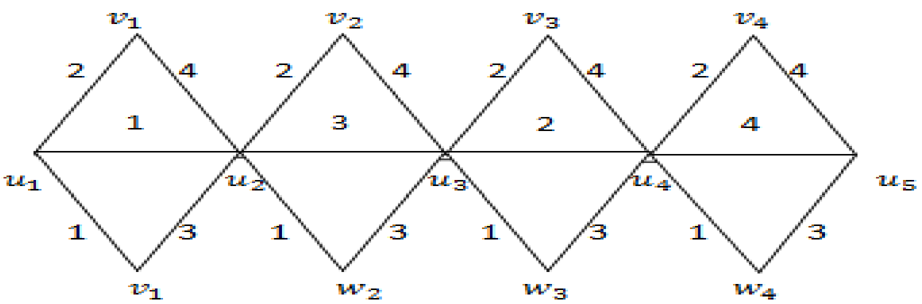

Fig-1: geometric mean 4-square E cordial labeling of $D_2(5C_3)$

In the above graph $f^*(u_1) = 1, f^*(u_2) = 0, f^*(u_3) = 0, f^*(u_4) = 1, f^*(u_5) = 1, f^*(v_1) = 0, f^*(v_2) = 0$, $f^*(v_3) = 0, f^*(v_4) = 0$, $f^*(w_1) = 0, f^*(w_2) = 0, f^*(w_3) = 0, f^*(w_4) = 0$. Hence $v_f(0) = 6, v_f(1) = 7$ this implies $|v_f(0) - v_f(1)| \leq 1$. Hence $D_2(5C_3)$is a geometric mean 4-square E cordial graph

Theorem :1

Star $(K_{1,n})$ is geometric mean 4-square e cordial graph

Proof: Let $V(K_{1,n}) = \{u, u_1, u_2, \dots, u_n\}$ be the vertices and $E(K_{1,n}) = \{uu_1, uu_2, uu_3, \dots, uu_n\}$ be the edges. To define the labeling function $f: E(G) \to \{1,2,3,4\}$ is defined as follows

$$f(uu_i) = \begin{cases} 1 \ \ if\ i \equiv 1\ (mod\ 4) \\ 2 \ \ if\ i \equiv \ 2\ (mod\ 4) \\ 3 \ \ if\ i \equiv \ 3\ (mod\ 4) \\ 4 \ \ if\ i \equiv 0\ (mod\ 4) \end{cases}$$

Define$f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$. Hence star graph admits geometric mean 4-square E cordial labeling and star graph is a geometric mean 4-square E cordial graph.

Theorem: 2

Path graph P_n is geometric mean 4-square E cordial graph if n is odd.

Proof: Let $V(P_n) = \{u_1, u_2, \dots, u_n\}$be the vertices and $E(P_n) = \{u_1u_2, u_2u_3, u_3u_4, \dots, u_{n-1}u_n\}$ be the edges. when n is odd. To define the labeling function $f: E(G) \to \{1,2,3,4\}$ is defined as follows

For$1 \leq i \leq \left\lfloor \frac{n}{2} \right\rfloor$

$$f(u_iu_{i+1}) = \begin{cases} 2 \quad if\ i \equiv \ 1,3\ (mod\ 4) \\ 4 \quad if\ i \equiv \ 2,4\ (mod\ 4) \end{cases}$$

For$\left\lfloor \frac{n}{2} \right\rfloor \leq i \leq n$

$$f(u_iu_{i+1}) = \begin{cases} 1 \quad if\ \ i \equiv 1,3\ (mod\ 4) \\ 3 \quad if\ i \equiv \ 2,4\ (mod\ 4) \end{cases}$$

Define$f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$and $|e_f(i) - e_f(j)| \leq 1$. Hence path admits geometric mean 4-square E cordial labeling and the path is a geometric mean 4-square E cordial graph.

Theorem: 3

Cycle C_n is geometric mean 4-square E cordial graph if n is odd.

Proof: Let $V(C_n) = \{u_1, u_2, \dots, u_n\}$ be the vertices and $E(C_n) = \{u_1u_2, u_2u_3, u_3u_4, \dots, u_nu_1\}$ be the edges. When n is odd. To define the labeling function $f: E(G) \to \{1,2,3,4\}$ is defined as follows

For$1 \leq i \leq \left\lfloor \frac{n}{2} \right\rfloor$

$$f(u_iu_{i+1}) = \begin{cases} 1 \quad if\ i \equiv \ 1,3\ (mod\ 4) \\ 3 \quad if\ i \equiv \ 2,4\ (mod\ 4) \end{cases}$$

For$\left\lfloor \frac{n}{2} \right\rfloor \leq i \leq n$

$$f(u_i u_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 2,4\ (mod\ 4) \end{cases}$$

Define$f^*: V(G) \rightarrow \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$and $|e_f(i) - e_f(j)| \leq 1$. Hence cycle admits geometric mean 4-square E cordial labeling and cycle is a geometric mean 4-square E cordial graph.

Theorem:4

Crown graph $C_n \odot K_2$ is geometric mean 4-square E cordial graph

Proof: Let $V(C_n \odot K_2) = \{u_1, u_2, u_3 \ldots, u_n, u'_1, u'_2, u'_3 \ldots, u'_n\}$ be the vertices and $E(C_n \odot K_2) = \{u_1u_2, u_2u_3, u_3u_4, \ldots, u_nu_1, u_1u'_1, u_2u'_2, u_3u'_3 \ldots, u_nu'_n\}$ be the edges.

To define the labeling function $f: E(G) \rightarrow \{1,2,3,4\}$ is defined as follows

For $1 \leq i \leq n-1$

$$f(u_i u_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 2,4\ (mod\ 4) \end{cases}$$

For $1 \leq i \leq n$

$$f(u_i u'_i) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 2,4\ (mod\ 4) \end{cases}$$

Define$f^*: V(G) \rightarrow \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$and $|e_f(i) - e_f(j)| \leq 1$. Hence Crown graph $C_n \odot K_2$ admits geometric mean 4-square E cordial labeling and the Crown graph $C_n \odot K_2$is a geometric mean 4-square E cordial graph.

Theorem:5

Armed crown graph $AC_n$is geometric mean 4-square E cordial graph if n is even

Proof: Let $u_1, u_2, u_3, \ldots\ldots u_n$ and $e_1, e_2, e_3, \ldots\ldots e_n$ be the vertices and edges in cycle C_n respectively. Let $v_1, v_2, v_3, \ldots\ldots v_n$ and $e'_1, e'_2, e'_3, \ldots\ldots, e'_n$ be the vertices and edges in path P_1 respectively. To construct Armed crown graph AC_njoin of vertex u_i of the cycle C_n to the vertex $w_1, w_2, w_3, \ldots\ldots w_n$by $e''_1, e''_2, e''_3, \ldots\ldots, e''_n$. Now $|V(AC_n)|$=3n and $|E(AC_n)|$=3n. u_iv_i

To define the labeling function $f: E(G) \rightarrow \{1,2,3,4\}$ is defined as follows

$$f(u_i u_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 2,4\ (mod\ 4) \end{cases}$$

For$1 \leq i \leq \frac{n}{2}$

$$f(u_i v_i) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

For $\frac{n}{2} < i \leq n$

$$f(u_i v_i) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

$$f(v_i w_i) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

Define $f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$and $|e_f(i) - e_f(j)| \leq 1$. Hence Armed crown graph AC_n admits geometric mean 4-square E cordial labeling and the Armed crown graph is a geometric mean 4-square E cordial graph.

Theorem:6

Combo graph $P_n \odot K_2$ is geometric mean 4-square E cordial graph.

Proof: Let V($P_n \odot K_2$) $= \{u_i, u_i' 1 \leq i \leq n\}$ be the vertices and E($P_n \odot K_2$) $= \{u_i u_{i+1}, uu_i', 1 \leq i \leq n\}$ be the edges. To define the labeling function $f: E(G) \to \{1,2,3,4\}$ is defined as follows

For $1 \leq i \leq n$

$$f(u_i u_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

$$f(uu_i') = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

Define $f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$and $|e_f(i) - e_f(j)| \leq 1$. Hence Combo graph $P_n \odot K_2$admits geometric mean 4-square E cordial labeling and Combo graph $P_n \odot K_2$is ageometric mean 4-square E cordial graph.

Theorem:7

Triangular snake graph nC_3 is geometric mean 4-square E cordial graph when n is odd.

Proof: Let the path P_n having the vertices $u_1, u_2, u_3, \ldots u_n$ and the edges $e_1, e_2, e_3 \ldots \ldots .. e_{n-1}$. To construct Triangular snake nC_3 from path P_n join u_i and u_{i+1} to a new edge $e_i$by edges$u_i e_i$ and $u_{i+1} e_i$, for i=1,2,3… … ..-n-1. Now $|V[nC_3]| = 2n - 1$ and is $|E[nC_3]| = 3n - 3$. To define the labeling function $f: E(G) \to \{1,2,3,4\}$

For $n \equiv 1,3\ (mod\ 4)$

For $1 \leq i \leq \left\lfloor \frac{n}{2} \right\rfloor$

$$f(u_i u_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

$f(u_i e_i)$ =2

$f(u_{i+1} e_i)$ =4

For$\left\lfloor \frac{n}{2} \right\rfloor \leq i \leq n$

$$f(u_i u_{i+1}) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

$f(u_i e_i)$ =2

$f(u_{i+1} e_i)$ =4

Define$f^*: V(G) \rightarrow \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2} / uv \in E(G) \right\rceil$ (mod 2). In each case the labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$ and $|e_f(0) - e_f(1)| \leq 1$.Hence Triangular snake nC_3admits geometric mean 4-square E cordial labeling and Triangular snake $nC_3$is a geometric mean 4-square E cordial al graph if n odd

Theorem:8

$D_2(nC_3)$is geometric mean 4-square E cordial graph.

Proof: Let the path P_n having the vertices $u_1, u_2, u_3 \ldots \ldots .. u_n$ and the edges $e_1, e_2, e_3 \ldots \ldots .. e_{n-1}$. To construct $D_2(T_n)$ from path P_n join u_i and u_{i+1} to a new edgesv_i by edges $u_i v_i$ and $u_{i+1} v_i$, for i=1,2,3… … ..-n-1 and join u_i and u_{i+1} to a new edgesw_i by edges $u_i w_i$ and$u_{i+1} w_i$, for i=1,2,3… … ..-n-1. Now $|\ V[D_2(nC_3)]| = 3n - 2$ and is $|\ E[nC_3]| = 5n - 5$

To define the labeling function $f: E(G) \rightarrow \{1,2,3,4\}$

For 1$\leq i \leq \frac{n-1}{2}$

$$f(u_i u_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

For $\frac{n-1}{2} < i \leq n$

$$f(u_i u_{i+1}) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

For 1$\leq i \leq n$

$f(u_i v_i) = 2$

$f(u_{i+1} v_i) = 4$

$f(u_i w_i) = 2$

$f(u_{i+1} w_i) = 4$

For n $\leq i \leq 2n - 2$

$f(u_iv_i) = 1$

$f(u_{i+1}v_i) = 3$

$f(u_iw_i) = 1$

$f(u_{i+1}w_i) = 3$

Define$f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \lceil \sqrt[n]{\prod f(uv)^2} /uv \in E(G) \rceil$ (mod 2)

In each case the labeling defined as above satisfies $|v_f(0) - v_f(1)| \le 1$and $|e_f(0) - e_f(1)| \le 1$. Hence $D_2(nC_3)$admits geometric mean 4-square E cordial labeling. That means $D_2(nC_3)$is a geometric mean 4-square E cordial graph if n odd

Theorem:9

Semi point total graph of path $T_2(P_n)$ is geometric mean 4-square E cordial graph if n is odd.

Proof: Let the path P_n having the vertices $u_1, u_2, u_3, \dots u_n$ and the edges $e_1, e_2, e_3 \dots \dots . e_{n-1}$. To construct Triangular snake nC_3 from path P_n join u_i and u_{i+1} to a new edge $e_i$by edgesu_ie_i and $u_{i+1}e_i$, for i=1,2,3… … ..-n-1. Now | $V[nC_3]| = 2n - 1$ and is | $E[nC_3]| = 3n - 3$

To define the labeling function $f: E(G) \to \{1,2,3,4\}$

For $n \equiv 1,3\ (mod\ 4)$

For$1 \le i \le \left\lfloor \frac{n}{2} \right\rfloor$

$$f(u_iu_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

$f(u_ie_i)$ =2

$f(u_{i+1}e_i)$ =4

For$\left\lfloor \frac{n}{2} \right\rfloor \le i \le n$

$$f(u_iu_{i+1}) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

$f(u_ie_i)$ =1

$f(u_{i+1}e_i)$ =3

Define$f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \lceil \sqrt[n]{\prod f(uv)^2} /uv \in E(G) \rceil$ (mod 2). In each case the labeling defined as above satisfies $|v_f(0) - v_f(1)| \le 1$and $|e_f(0) - e_f(1)| \le 1$. Hence Semi point total graph of path $T_2(P_n)$admits geometric mean 4-square E cordial labeling and Semi point total graph of path $T_2(P_n)$is a geometric mean 4-square E cordial al graph if n odd

Theorem :10

$T_2(C_n)$is geometric mean 4-square E cordial graph

Proof: Let C_p be a cycle for, with vertex set $V(C_n)$ = $\{u_1, u_2, \dots, u_n\}$and edge set$E(C_p)$ = $\{e_1, e_2, \dots, e_n\}$. Now, $V(T_2(C_p))$ = $\{u_1, u_2, \dots, u_n, v_1, v_2, \dots, v_n\}$be vertices of $T_2(C_n)$. To construct $T_2(C_n)$ from cycleC_n join u_i and u_{i+1} to a new vertexv_i by adding edgesu_iv_i and $u_{i+1}v_i$, for i=1,2,3… … ..n. Now $|V[T_2(C_n)]| = 2n$ and is $|E[T_2(C_n)]| = 3n$

To define the labeling function $f: E(G) \to \{1,2,3,4\}$ is defined as follows

$$f(u_iu_{i+1}) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$$

$f(u_iv_i) = 3,$

$f(u_{i+1}v_i) = 4$

Define$f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$ and $|e_f(0) - e_f(1)| \leq 1$. Hence $T_2(C_n)$ admits geometric mean 4-square E cordial labeling and the $T_2(C_n)$ is ageometric mean 4-square E cordial graph

Theorem :11

Peterson graph is a geometric mean 4-square E cordial graph

Proof: Let V(G)= $\{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9, v_{10}\}$ be the vertices and E(G)=$\{e_1 = v_1v_2,\ e_2 = v_2v_3, e_3 = v_3v_4,\ e_4 = v_4v_5, e_5 = v_5v_2, e_6 = v_1v_6,\ e_7 = v_2v_7,\ e_8 = v_3v_8, e_9 = v_4v_9,\ e_{10} = v_5v_{10}, e_{11} = v_6v_8, e_{12} = v_6v_9, e_{13} = v_3v_9, e_{14} = v_9v_{10}, e_{15} = v_8v_{10}\}$be the edges of Peterson graph.

To define the labeling function $f: E(G) \to \{1,2,3,4\}$ is defined as follows.

$f(e_1) = 1, f(e_2) = 2,\ f(e_3) = 3, f(e_4) = 2, f(e_5) = 3,\ \ f(e_6) = 3, f(e_7) = 1,\ f(e_8) = 1, f(e_9) = 1, f(e_{10}) = 2, f(e_{11}) = 4, f(e_{12}) = 4,\ f(e_{13}) = 4, f(e_{14}) = 4, f(e_{15}) = 3$, Define$f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2). Here $v_f(0) = 5\ and\ v_f(1) = 5$. The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$and $|e_f(i) - e_f(j)| \leq 1$.Hence Peterson graph admits geometric mean 4-square E cordial labeling and Peterson graph is a geometric mean 4-square E cordial graph

Theorem: 12

Dragon graph$T_{m,m}$ (n=m+m) is geometric mean 4-square E cordial graph

Proof: Let $V(T_{r,t}) = \{u_1, u_2, u_3, \dots, u_m, v_2, v_3, \dots, v_{m-1}\}$ be the vertices and $E(T_{r,t}) = \{u_1u_2, u_2u_3, u_3u_4, \dots, u_mu_{1,}u_nv_{2,}, v_2v_3, v_2v_3, v_3v_4, \dots, v_{m-2}v_{m,}\}$ be the edges. To define the labeling function $f: E(G) \to \{1,2,3,4\}$ is defined as follows

Case: 1 if r is odd

For $1 \leq i \leq n-1$

$f(u_i u_{i+1}) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$

$f(u_m v_2) = 2$

$f(v_i v_{i+1}) = \begin{cases} 2 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 4 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$

Case: 1 if r is even

For $1 \leq i \leq n-1$

$f(u_i u_{i+1}) = \begin{cases} 1 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 3 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$

$f(u_m v_{i+1}) = 4\ if\ i = 1(mod4)$

$f(v_i v_{i+1}) = \begin{cases} 4 & if\ i \equiv\ 1,3\ (mod\ 4) \\ 2 & if\ i \equiv\ 0,2\ (mod\ 4) \end{cases}$

Define$f^*: V(G) \to \{0,1\}$ defined by $f^*(u) = \left\lceil \sqrt[n]{\prod f(uv)^2}\ /uv \in E(G) \right\rceil$ (mod 2)

The labeling defined as above satisfies $|v_f(0) - v_f(1)| \leq 1$. Hence dragon graph$T_{r,t}$ admits geometric mean 4-square E cordial labeling and dragon graph$T_{r,t}$ is ageometric mean 4-square E cordial graph.

Conclusion

In this paper a new labeling called geometric mean 4-square E cordial labeling is defined. Then show that some general graphs are admits the geometric mean 4-square E cordial labeling. In next paper some more special graphs checked for geometric mean 4-square E cordial

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