ISSN: 0474-9030

Vol-68-Issue-1-January-2020

A Study of Labeling's and Decompositions of Difference Graphs

J.LISY BENNET
Ph.D. Research Scholar, Part-Time
Reg.No:17223162092022,
Department of Mathematics
Scott Christian College,(Autonomous), Nagercoil,
Affiliated to Manonmaniam Sundaranar University,
Abishekapatti,Tirunelveli,Tamilnadu,India.
DR. S. CHANDRA KUMAR,
Assistant Professor,
Department of Mathematics
Scott Christian College (Autonomous), Nagercoil,
Affiliated to Manonmaniam Sundaranar University,
Abishekapatti, Tirunelveli , Tamilnadu, India.

ABSTRACT

Difference labelings of a graph C are acknowledged by appointing unmistakable whole number qualities to every vertex and afterward connecting with each edge the supreme distinction of those qualities doled out to its end vertices. A decomposition of a labeled graph into parts, each part containing the edges having a typical weight is known as a typical weight decomposition. Right now explore the presence of labelings for cycles, cartesian result of two graphs, rn-crystals, rectangular matrices and n-solid shapes which deteriorate these graphs into indicated parts. We likewise examine the comparing issue for added substance labelings.

KEYWORDS: Libeling's, Decompositions, Difference Graphs, substance labeling.

INTRODUCTION

A graph with a distinction labeling characterized on it is known as a labeled graph. A decomposition of a labeled graph into parts, each part containing the edges having a typical

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

weight is called basic weight decomposition. A typical weight decomposition of G in which each part contains rn edges is called rn-fair.

A timberland wherein every segment is a way is known as a direct woods. Blossom and Ruiz [13] share demonstrated that each part for all intents and purpose weight decomposition is a direct timberland and the vertices of least and most extreme mark are not interior vertices in any way of a section containing it. Right now consider the accompanying issue given in [13].

Let C = (V E) be a graph. A distinction labeling of C is an infusion f from V to the set of non-negative numbers together with the weight function f on E given by f*(uv) = f(u) - f(v)I for each edge uv E.

Specified Parts Decomposition Problem. Given a graph C with edge set E(C) and an assortment of edge-disjoint straight woods F_1, F2,...,F_k containing a sum of JEJ edges, does there exist a typical weight decomposition of C whose parts are individually isomorphic to F_1 , F_2,..., F_k?

We get normal weight decompositions into determined parts for cycles, cartesian item G_1 x C_2 of two graphs C_1 and C_2 , rn-crystals Cm x P, rectangular matrices Pm X P and for n-shapes Q. We likewise talk about the comparing issue for added substance labelings.

Theorem 4.1. A labeling exists for every cycle with ns edges $(s \neq 4)$ which decomposes it into n copies of sP2.

Proof. Let $C_{ns} = (v_0, v_1, \dots, v_{ns-1}, v_0)$.

If $s = 1$, the labeling f defined by,

$$f(v_i) = \frac{i(i+2)}{2}, \quad 0 \leq i \leq n-1$$

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

decomposes C_{2n} into n copies of $2P_2$.

Now let $s \geq 3$.

Case (i) s is odd.

Define a labeling f as follows.

$$f(v_0) = 0.$$

For $1 \leq i \leq \left\lceil \frac{ns}{2} \right\rceil + 1$,

$$f(v_i) = \begin{cases} f(v_{i-1}) + j & \text{if } 1 \leq j \leq n-1 \text{ and } i \equiv j \pmod{n} \\ f(v_{i-1}) + \frac{n(n-1)}{2} & \text{if } i \equiv 0 \pmod{n}. \end{cases}$$

For $1 \leq i \leq \left\lfloor \frac{ns}{2} \right\rfloor - 2$,

$$f(v_{ns-i}) = \begin{cases} f(v_{ns-(i-1)}) + \frac{n(n-1)s}{2} & \text{if } i \equiv 1 \pmod{n} \\ f(v_{ns-(i-1)}) + (n-j+1) & \text{if } 2 \leq j \leq n-1 \text{ and } i \equiv j \pmod{n} \\ f(v_{ns-(i-1)}) - 1 & \text{if } i \equiv 0 \pmod{n}. \end{cases}$$

Case (ii) s is even.

Define a labeling *f* as follows.

$$f(v_0) = 0.$$

$$f(v_{ns-1}) = \frac{n(n-1)s}{2}.$$

$$f(v_{ns-i}) = f(v_{ns-(i-1)}) - (n-i+1) \text{ if } 2 \leq i \leq n.$$

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

$$f(v_i) = \begin{cases} f(v_{i-1}) + j & \text{if } 1 \leq j \leq n-1 \text{ and } i \equiv j \pmod{n} \\ f(v_{i-1}) + \frac{n(n-1)s}{2} & \text{if } i \equiv 0 \pmod{n}. \end{cases}$$

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

For $\frac{ns}{2} - (n-1) \leq i \leq \frac{ns}{2} - 1$,

$$f(v_i) = f(v_{i-1}) - j \text{ if } 1 \leq j \leq n-1 \text{ and } i \equiv j \pmod{n}.$$

For $n+1 \leq i \leq \frac{ns}{2}$,

$$f(v_{ns-i}) = \begin{cases} f(v_{ns-(i-1)}) + \frac{n(n-1)s}{2} & \text{if } i \equiv 1 \pmod{n} \\ f(v_{ns-(i-1)}) + (n-j+1) & \text{if } 2 \leq j \leq n-1 \text{ and } i \equiv j \pmod{n} \\ f(v_{ns-(i-1)}) + 1 & \text{if } i \equiv 0 \pmod{n}. \end{cases}$$

In both cases the labeling *f* defined above realizes a decomposition of C_{ns} into n copies of sP_2.

A common-weight decomposition of an even cycle into two immaculate matching's. In the accompanying theorem we get a comparative outcome for odd cycles.

Theorem 1.1. There is a labeling of the odd cycle $C_{2s+1},\ s \geq 2$ which decomposes it into one maximum matching and $(s-1)P_2 \cup P_3$.

Proof. Let $C_{2s+1} = (v_0, v_1, v_2, \ldots, v_{2s}, v_0)$. The labeling f defined by

$$f(v_0) = 0$$

$$f(v_{2s}) = s$$

$$f(v_{2s-1}) = 2s$$

$$f(v_1) = s-1$$

$$f(v_2) = 2s-1$$

$$f(v_i) = f(v_{i-1}) + s - 1 \text{ if } 3 \leq i \leq 2s-2 \text{ and } i \text{ is odd}$$

and $f(v_i) = f(v_{i-1}) - s$ if $3 \leq i \leq 2s-2$ and i is even

decomposes C_{2s+1} into a maximum matching and $(s-1)P_2 \cup P_3$.

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Theorem 1.2.let C* be the graph gotten from C by appending a way of length n - 1 to every vertex of C. In the event that G has a typical weight decomposition into k parts C_1, C_2,. . . , Gk, at that point the graph C* has a typical weight decomposition into C_1, C_2,.. . , Gk and mP where m is the number of vertices of C.

Proof. Let $V(G) = \{v_1, v_2, \ldots, v_m\}$ and let $P_i = (w_{i1}, w_{i2}, \ldots, w_{in})$ with $v_i = w_{i1}$ for $1 \leq i \leq m$ be the path of length $n-1$ attached at v_i.

Let *f* be the labeling realizing a decomposition of C into C_1, G_2... G_k. Then the labeling g on G* defined by

$$g(v_i) = nf(v_i)$$

$$g(w_{ij}) = g(v_i) + j - 1 \text{ for } 2 \leq j \leq n$$

realizes a common-weight decomposition of G* into $G_1, G_2, \ldots, G_k$ and mP_n.

Theorem 1.3. If a connected graph G_1 has common-weight decomposition into m1 linear forests $L_1, L_2, \ldots, L_{m_1}$ and a connected graph G_2 has a common-weight decomposition into m2 linear forests $M_1, M_2, \ldots, M_{m_2}$, *then* $G_1 \times G_2$ has a common-weight decomposition into m1 + m2 linear forests $p_2L_1,\ p_2L_2,\ \ldots,\ p_2L_{m_1},\ p_1M_1,\ p_1M_2,\ \ldots,\ p_1M_{m_2}$.

Proof. Let $V(G_1) = \{v_1, v_2, \ldots, v_{p_1}\}$ and $V(G_2) = \{w_1, w_2, \ldots, w_{p_2}\}$. Let f and g be the labelings of G_1 and G_2 such that the common-weight decomposition of G_1 with respect to f is $L_1, L_2, \ldots, L_{m_1}$ and the common-weight decomposition of G_2 with respect to g is $M_1, M_2, \ldots, M_{m_2}$. Since G_1 and G_2 are connected we may assume without loss of generality that the vertices of G_1 and G_2 are arranged in such a way that for $i > 1$, each v_i is adjacent to v_j for some $j < i$, $f(v_1) = g(w_1) = 0$ and $g(w_i) < g(w_{i+1})$ for all i, $1 \leq i \leq p_2 - 1$.

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Let $s = \max_{v \in V(G_1)} f(v) + 1, \quad t = \max_{w \in V(G_2)} g(w) + 1, \quad \text{and } r = st.$

Define a labeling h on $V(G_1 \times G_2)$ by

$$h(v_1, w_j) = rg(w_j) \text{ if } 1 \leq j \leq p_2$$

$$\text{and } h(v_i, w_j) = h(v_1, w_j) + f(v_i) \text{ if } 1 \leq j \leq p_2 \text{ and } 2 \leq i \leq p_1.$$

First we prove that h is .injective.

Suppose $h(v_{i1}, w_{j1}) = h(v_{i2}, w_{j2})$ where $1 \leq i_1, i_2 \leq p_1$ and $1 \leq j_1, j_2 \leq p_2$ with $(v_{i1}, w_{j_1}) \neq (v_{i2}, w_{j2})$. Then

$h(v_1, w_{j1}) + f(v_{i1}) = h(v_1, w_{j2}) + f(v_{i2})$. Thus

$$|h(v_1, w_{j1}) - h(v_1, w_{j2})| = |f(v_{i2}) - f(v_{i1})| \qquad \cdots (1)$$

Case (i) $i_1 \neq i_2$ and $j_1 \neq j_2$.

Then the left hand side of (1) is a multiple of r and right hand side of (1) is less than s. Thus $\ell \cdot r < s$ which is not possible since $r = st$.

Case (ii) $i_1 \neq i_2$ and $j_1 = j_2$.

Then left hand side of (1) is equal to zero and hence $|f(v_{i2}) - f(v_{i1})| = 0$.

Thus $f(v_{i1}) = f(v_{i2})$ which is not possible since f is injective.

Case (iii) $i_1 = i_2$ and $j_1 \neq j_2$.

Then right hand side of (1) is zero and hence $h(v_1, w_{j_1}) = h(v_1, w_{j_2})$. From the definition of $h(v_1, w_j)$, we obtain $g(w_{j_1}) = g(w_{j_2})$ which is not possible since g is injective. Hence h is injective and it can be easily verified that h realizes a common-weight decomposition of $G_1 \times G_2$ $p_2 L_1, p_2 L_2, \ldots, p_2 L_{m_1}$ and $p_1 M_1, p_1 M_2, \ldots, p_1 M_{m_2}$.

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Corollary 1.4. A labeling exists for the prism $C_m \times P_n$ *with* $m = 2s$ and $s \neq 4,$ which decomposes it into two perfect matchings and $mP_n.$

Corollary 1.5. There is a labeling of the prism $C_m \times P_n,$, realizing a decomposition of $C_m \times P_n$ *into* nP_{m_1+1}, nP_{m_2+1} and mP_n where $m_1 + m_2 = m$ and m_1 and m_2 are relatively prime.

Corollary 1.6. There is a labeling of the rectangular grid $P_m \times P_n$ re- alizing a decomposition o $P_m \times P_n$ *into* nP_m and $mP_n.$

Corollary 1.7. There is a labeling realizing a common-weight decomposition of Q into n perfect matchings.

Proof. From Theorem 4.4, if C has common-weight decomposition into ri perfect matching's then C x K_2 has a common-weight decomposition into n + 1 perfect matching's. Since $Q_n = Q_{n-1} \times K_2$ the result follows.

Corollary 1.8. Q_n *is* 2^{n-1} equitable.

Remark 1.1. The common-weight decompositions given in Corollaries are actually factorizations and the decomposition given in Corollary is a 1-factorization.

Theorem 1.1. Let C be an associated graph of greatest degree 3 and breadth d where d>1. At that point C can't have a common weight decomposition where all the segment ways in each part have length more noteworthy than d.

Proof. Suppose there exists a labeling f on C which deteriorates G into parts in which the entirety of the segment ways in each part have length more noteworthy than d. Leave it and v alone the vertices of least and most extreme labels separately.

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Let $d(u,v) = k,\ 1 \leq k \leq d$. Let $P = (u = u_0, u_1, \ldots, u_k = v)$ be a most limited u-v way. By Theorem 1.39 u and v are not interior vertices in any way of a section containing it. Since each way in any piece of the decomposition is of length more prominent than d, P can't be remembered for one section. Presently let Qi be the way of the part containing the edge uoui in the common-weight decomposition. Let S indicate the set of all edges of P not secured by Qi. Since A < 3, the subgraph actuated by the set of all edges in S contains in any event one way say $P_1 = (u_i, u_{i+1}, \ldots, u_{i+j}), 1 \leq i < i+j \leq k$ such that P1 is not included in one part of the decomposition and u_i and u_{i+j} are not inward vertices in any way of a section containing it. By proceeding with this procedure we acquire an edge UmUm+1 in P to such an extent that this edge is excluded from any piece of the common-weight decomposition, which is an inconsistency.

Theorem 1.2. There exists a labeling which realizes a common-weight decomposition of the Kronecker product $P_m \times P_n$ into two copies of $\left\lfloor \frac{n}{2} \right\rfloor (m-1)K_2$ *and two copies of* $\left\lceil \frac{n-2}{2} \right\rceil (m-1)K_2$.

Proof. Let $P_m = (v_0, v_1, v_2, \ldots, v_{m-1})$ and $P_n = (w_0, w_1, w_2, \ldots, w_{n-1})$.

$$V(P_m \times P_n) = \left\{(v_i, w_j) \,\middle|\, 0 \leq i \leq m-1,\ 0 \leq j \leq n-1\right\}.$$

Case (i) m is odd.

Define a labeling f on $V(P_m \times P_n)$ as follows.

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

$$f\left((v_i, w_j)\right) = \frac{3}{2}i + (3m-1)\frac{j}{4} \quad \text{if } i \text{ and } j \text{ are even, } 2 \le j \le n-2 \text{ if } n \text{ is even, } 2 \le j \le n-1 \text{ if } n \text{ is odd and } 0 \le i \le m-1.$$

$$f\left((v_{i+1}, w_{j+1})\right) = f\left((v_i, w_j)\right) + 1 \quad \text{if } i \text{ and } j \text{ are even and } 0 \le i \le m-3, \ 0 \le j \le n-2 \text{ if } n \text{ is even, } 0 \le j \le n-3 \text{ if } n \text{ is odd.}$$

Let $t = \begin{cases} \frac{3}{2}(m-1) + \frac{1}{4}(3m-1)(n-2) + 3 & \text{if } n \text{ is even} \\ \frac{3}{2}(m-1) + \frac{1}{4}(3m-1)(n-1) + 3 & \text{if } n \text{ is odd.} \end{cases}$

$$f\left((v_i, w_j)\right) = t + \frac{3}{2}(i-1) + \frac{1}{4}(3m-1)j \quad \text{if } i \text{ is odd, } j \text{ is even, } 2 \le j \le n-1 \text{ if } n \text{ is odd, } 2 \le j \le n-2 \text{ if } n \text{ is even, and } 1 \le i \le m-2.$$

$$f\left((v_{i-1}, w_{j+1})\right) = f\left((v_i, w_j)\right) - 2 \quad \text{if } j \text{ is even, } i \text{ is odd, } 0 \le j \le n-3 \text{ if } n \text{ is odd, } 0 \le j \le n-2 \text{ if } n \text{ is even, and } 1 \le i \le m-2.$$

$$f\left((v_{m-1}, w_j)\right) = f\left((v_{m-3}, w_j)\right) + 3 \quad \text{if } 1 \le j \le n-2 \text{ if } n \text{ is odd and } 1 \le j \le n-1 \text{ if } n \text{ is even.}$$

Then the set of edges S_1, S_2, S_3 and S_4 forms a common-weight decomposition of $P_m \times P_n$ into two copies of $\left\lfloor \frac{n}{2} \right\rfloor (m-1)K_2$ and two copies of

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

$\left\lceil \frac{n}{2} \right\rceil (m-1)K_2$ where

$$S_1 = \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \middle| \begin{array}{c} i \text{ and } j \text{ are even,} \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \\ 0 \le j \le n-2 \text{ if } n \text{ is even} \\ \text{and } 0 \le i \le m-3 \end{array} \right\}$$

$$\bigcup \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \middle| \begin{array}{c} i \text{ is odd and } j \text{ is even,} \\ 1 \le i \le m-2 \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \\ \text{and } 0 \le j \le n-2 \text{ if } n \text{ is even} \end{array} \right\}$$

$$S_2 = \left\{ (v_i, w_j)(v_{i-1}, w_{j+1}) \middle| \begin{array}{c} i \text{ and } j \text{ are even,} \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \\ 0 \le j \le n-2 \text{ if } n \text{ is even} \\ \text{and } 2 \le i \le m-1 \end{array} \right\}$$

$$\bigcup \left\{ (v_i, w_j)(v_{i-1}, w_{j+1}) \middle| \begin{array}{c} i \text{ is odd and } j \text{ is even,} \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \\ 0 \le j \le n-2 \text{ if } n \text{ is even} \\ \text{and } 1 \le i \le m-2 \end{array} \right\}$$

$$S_3 = \left\{ (v_i, w_j)(v_{i-1}, w_{j+1}) \middle| \begin{array}{c} i \text{ and } j \text{ are odd,} \\ 1 \le j \le n-3 \text{ if } n \text{ is even} \\ 1 \le j \le n-2 \text{ if } n \text{ is odd} \\ \text{and } 1 \le i \le m-2 \end{array} \right\}$$

$$\bigcup \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \middle| \begin{array}{c} i \text{ is even and } j \text{ is odd,} \\ 1 \le j \le n-3 \text{ if } n \text{ is even} \\ 1 \le j \le n-2 \text{ if } n \text{ is odd} \\ \text{and } 2 \le i \le m-3 \end{array} \right\}$$

$$S_4 = \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \middle| \begin{array}{c} i \text{ and } j \text{ are odd,} \\ 1 \le j \le n-3 \text{ if } n \text{ is even} \\ 1 \le j \le n-2 \text{ if } n \text{ is odd} \\ \text{and } 1 \le i \le m-2 \end{array} \right\}$$

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

$$\bigcup \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \;\middle|\; \begin{array}{c} i \text{ is even and } j \text{ is odd,} \\ 1 \leq j \leq n-3 \text{ if } n \text{ is even} \\ 1 \leq j \leq n-2 \text{ if } n \text{ is odd} \\ \text{and } 2 \leq i \leq m-3 \end{array} \right\}$$

Case (ii) m is even.

Define a labeling f on $V(P_m \times P_n)$ by

$$f\big((v_i, w_j)\big) = \frac{3i}{2}i + \frac{3mj}{4} \quad \text{if } i \text{ and } j \text{ are even, } 0 \leq i \leq m-2$$
$$0 \leq j \leq n-2 \text{ if } n \text{ is even and}$$
$$0 \leq j \leq n-1 \text{ if } n \text{ is odd.}$$

$$f\big((v_{i+1}, w_{j+1})\big) = f\big((v_i, w_j)\big) + 2 \quad \text{if } i \text{ and } j \text{ are even, } 0 \leq i \leq m-2,$$
$$0 \leq j \leq n-2 \text{ if } n \text{ is even and}$$
$$0 \leq j \leq n-3 \text{ if } n \text{ is odd.}$$

$$\text{Let } t = \begin{cases} \frac{3}{2}(m-2) + \frac{3}{4}3m(n-2) + 4 & \text{if } n \text{ is even} \\ \frac{3}{2}(m-2) + \frac{3}{4}m(n-1) + 2 & \text{if } n \text{ is odd.} \end{cases}$$

$$f\left((v_i, w_j)\right) = t + \frac{3}{2}(i-1) + \frac{3}{4}mj \quad \text{if } i \text{ is odd, } j \text{ is even,}$$
$$0 \leq j \leq n-2 \text{ if } n \text{ is even,}$$
$$0 \leq j \leq n-3 \text{ if } n \text{ is odd,}$$
$$\text{and } 1 \leq i \leq m-2.$$

$$f\left((v_{i-1}, w_{j+1})\right) = f\left((v_i, w_j)\right) - 1 \quad \text{if } i \text{ is even, } j \text{ is odd, } 1 \leq i \leq m-1$$
$$0 \leq j \leq n-2 \text{ if } n \text{ is even,}$$
$$\text{and } 0 \leq j \leq n-3 \text{ if } n \text{ is odd.}$$

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Then the set of edges S_1', S_2', S_3' and S_4' forms a common-weight decomposition of $P_m \times P_n$ into two copies of $\left\lfloor \frac{n}{2} \right\rfloor (m-1)K_2$ and two copies of $\left\lceil \frac{n}{2} \right\rceil (m-1)K_2$ where

$$S_1' = \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \;\middle|\; \begin{array}{c} i \text{ and } j \text{ are even, } 2 \le i \le m-2 \\ 0 \le j \le n-2 \text{ if } n \text{ is even and} \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \end{array} \right\}$$

$$\bigcup \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \;\middle|\; \begin{array}{c} i \text{ is odd, } j \text{ is even,} \\ 0 \le j \le n-2 \text{ if } n \text{ is even} \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \\ \text{and } 1 \le i \le m-3 \end{array} \right\}$$

$$S_2' = \left\{ (v_i, w_j)(v_{i-1}, w_{j+1}) \;\middle|\; \begin{array}{c} i \text{ and } j \text{ are even,} \\ 0 \le j \le n-2 \text{ if } n \text{ is even} \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \\ \text{and } 2 \le i \le m-2 \end{array} \right\}$$

$$\bigcup \left\{ (v_i, w_j)(v_{i-1}, w_{j+1}) \;\middle|\; \begin{array}{c} i \text{ is odd and } j \text{ is even,} \\ 0 \le j \le n-2 \text{ if } n \text{ is even} \\ 0 \le j \le n-3 \text{ if } n \text{ is odd} \\ \text{and } 1 \le i \le m-1 \end{array} \right\}$$

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

$$S_3' = \left\{ (v_i, w_j)(v_{i-1}, w_{j+1}) \,\middle|\, \begin{array}{c} i \text{ and } j \text{ are odd,} \\ 1 \leq j \leq n-3 \text{ if } n \text{ is even} \\ 1 \leq j \leq n-2 \text{ if } n \text{ is odd} \\ \text{and } 1 \leq i \leq m-2 \end{array} \right\}$$

$$\cup \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \,\middle|\, \begin{array}{c} i \text{ is even and } j \text{ is odd,} \\ 1 \leq j \leq n-3 \text{ if } n \text{ is even} \\ 1 \leq j \leq n-2 \text{ if } n \text{ is odd} \\ \text{and } 2 \leq i \leq m-2 \end{array} \right\}$$

$$S_4' = \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \,\middle|\, \begin{array}{c} i \text{ and } j \text{ are odd,} \\ 1 \leq j \leq n-3 \text{ if } n \text{ is even} \\ 1 \leq j \leq n-2 \text{ if } n \text{ is odd} \\ \text{and } 1 \leq i \leq m-3 \end{array} \right\}$$

$$\cup \left\{ (v_i, w_j)(v_{i+1}, w_{j+1}) \,\middle|\, \begin{array}{c} i \text{ is even and } j \text{ is odd,} \\ 1 \leq j \leq n-3 \text{ if } n \text{ is even} \\ 1 \leq j \leq n-2 \text{ if } n \text{ is odd} \\ \text{and } 0 \leq i \leq m-2 \end{array} \right\}.$$

Hence the theorem.

CONCLUSION

A graph G is a limited nonempty set of items assembled vertices with a lot of unordered pairs of distinct vertices of G which is called edges indicated by V (G) and E (G), individually. On the off chance that e = {u, v} is an edge, we compose e = uv; we state that e joins the vertices u and v; u and v are neighboring vertices; u and v are occurrence with e. On the off chance that two vertices are not joined, at that point we state that they are non-adjoining. In the event that two distinct edges are episode with a typical vertex, at that point they are said to be contiguous one another. A graph G comprises of a limited nonempty set V of vertices together with a set E, disjoint from V whose components are unordered pairs of distinct vertices of V. Every component e = { u, v } of E is called an edge of G, and e is said to join u and v. We compose e = uv and state that u and v are the parts of the bargains are occurrence with e. They are likewise

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

called neighboring vertices; edges which are episode with a typical vertex are called adjoining edges. A graph with p vertices and q edges is known as a (p, q) graph. An edge whose finishes are indistinguishable is known as a circle and edges having similar end vertices are called different edges. A graph which contains neither circles nor various edges is known as a straightforward graph.

REFERENCES

- L.F.Mao, Combinatorial Geometry with Applications to Field Theory, InfoQuest, USA,2009.
- L.F.Mao, Smarandache Multi-Space Theory, Hexis, Phoenix, USA, 2006.
- L.F.Mao, Automorphism Groups of Maps, Surfaces and Smarandache Geometries, American Research Press, 2005.
- L.F.Mao, Combinatorial Fields - An Introduction, International J.Math.Combin., Vol.3,2009, 1-22.
- ShreedharK, B. Sooryanarayana and Raghunath P., Smarandachely k-Constrained labeling of Graphs, International J.Math.Combin. Vol.1 (2009), 50-60.
- P. DevadasRao, B. Sooryanarayana and M. Jayalakshmi, Smarandachely k-Constrained Number of Paths and Cycles, International J.Math. Combin. Vol.3 (2009), 48-60.
- R. Vasuki and A. Nagarajan, Some Results on Super Mean Graphs, International J.Math. Combin. Vol.3 (2009), 82-96.
- Bibin K. Jose, Open Distance-Pattern Uniform Graphs, International J.Math.Combin. Vol.3 (2009), 103-115.
- Zhongfu Zhang et.al., On the AVSDT-Coloring of Sm+Wn, International J.Math. Combin. Vol.3 (2008), 105-110.
- Jingwen Li, Zhongfu Zhang, Zhiwen Wang, Enqiang Zhu, Fei Wen and Bing Yao, The Smarandachely adjacent-vertex total coloring of three classes of 3-regular Halin graphs, Computational Intelligence and Software Engineering, 2009. CiSE 2009. International Conference on Issue Date: 11-13 Dec. 2009.

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

- Enqiang Zhu, Zhiwen Wang and Zhongfu Zhang, On the Smarandachely-adjacent-vertex edge coloring of some double graphs, J.Shandong University(Natural Science), 44(12) ,2009.
- XunjingLv, Smarandachely Adjacent Vertex Totol of Graph Pm + Pn, Ludong University Journal(Natural Science), 25(4), 2009.
- Shaowei Liang, On the Smarandachely Adjacent Vertex Total Coloring of k-Cube Graph, Journal of Tangshan College, Vol.22, 3(2009).
- Shaowei Liang, On Smarandachely Adjacent Edge Coloring of a Class of Extended Petersen Graph, J. Hebei North University(Natural Science), 25(5), 2009.
- Xiangen Chen and Zhongfu Zhang, Adjacent vertex distinguishing total coloring on Pm ∨Pn, Journal of Northwest Normal University (Natural Science), Vol.41, 1(2005).