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Star Related V_4 *Cordial graphs*

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Abstract:

Let $< A\ ,\ *>$ be any abelian group. A graph G = (V(G), E(G)) is said to be A-cordial[6] if there is a mapping f: V(G) →A which satisfies the following two conditions with each edge
e= uv is labeled as f(u)*f(v).

(i)$|v_f(a) - v_f(b)| \leq 1$, ∀ a,b∈A

(ii)$|e_f(a) - e_f(b)| \leq 1$, ∀ a,b∈A

where$v_f(a)$= the number of vertices with label a

$v_f(b)$= the number of vertices with label b

$e_f(a)$= the number of edges with label a

$e_f(b)$= the number of edges with label b

We note that if A = <V_4 , *> is a multiplicative group. Then the labeling is known as **V_4 Cordial Labeling.** A graph is called a **V_4 Cordial graph** if it admits a V_4 Cordial Labeling.

In this paper,It is proved thatZ-(P_n), Bookand $K_{1,1,n}$are **V_4Cordial graphs**.

AMS Mathematics subject classification 2010:05C78

Keywords and Phrases: Cordial labeling, **V_4**Cordial Labeling and **V_4**Cordial Graph.

1.Introduction:

By a graph, it means a finite undirected graph without loops or multiple edges.For graph theoretic terminology, we referred Harary [4]. For labeling of graphs, we referredGallian[1].

A vertex labeling of a graph G is an assignment of labels to the vertices of G that induces for each edge *uv* a label depending on the vertex labels of *u* and *v*.

A graph *G* is said to be labeled if the *n* vertices are distinguished from one another by symbols such as $v_1, v_2, \ldots, v_n$.In a labeling of a particular type, the vertices are assigned distinct values from a given set, which induces distinguish edge values satisfying certain conditions. The concept of graceful labeling was introduced by Rosa[3] in 1967 and subsequently by Golomb[2].In this paper , It is proved that Z-(P_n), Book and$K_{1,1,n}$are **V_4Cordial graphs**.

2.Preliminaries

Definition 2.1:

Let G = (V,E) be a simple graph.Let f:V(G)→{0,1} and for each edge uv , assign the label |f(u) − f(v)|. f is called a **cordial labeling** if the number of vertices labeled 0 and the the number of vertices labeled 1 differ by atmost

1 and also the number of edges labeled 0 and the the number of edges labeled 1 differ by atmost 1. A graph is called **Cordial** if it has a cordial labeling.

Definition 2.2:

Let $< A\ ,\ *>$ be any abelian group. A graph G = (V(G), E(G)) is said to be A-cordial if there is a mapping f: V(G) →A which satisfies the following two conditions with each edge

e= uv is labeled as f(u)*f(v).

(i)$|v_f(a) - v_f(b)| \leq 1$, ∀ a,b∈A

(ii)$|e_f(a) - e_f(b)| \leq 1$, ∀ a,b∈A

where$v_f(a)$= the number of vertices with label a.

$v_f(b)$= the number of vertices with label b.

$e_f(a)$= the number of edges with label a.

$e_f(b)$= the number of edges with label b.

It is note that if A = <V_4 , *> is a multiplicative group. Then the labeling is known as **V_4 Cordial Labeling.** A graph is called a **V_4 Cordial graph** if it admits a V_4 Cordial Labeling.

Definition 2.3:

Z-(P_n) is a graph obtained by, in a pair of path P_n, in which i^{th}vertex of a path P_1 is joined with $i+1^{th}$ vertex of a path P_2 .

Definition 2.4[1]:

Define the product $G_1 \times G_2$by, consider any two vertices u = (u_1 ,u_2), and v = (v_1 , v_2) in $V_1 \times V_2$. Then u and v are adjacent in $G_1 \times G_2$

whenever (u_1 = v_1 and u_2 adj to v_2) or (u_2 = v_2 and u_1 adj to v_1).

The product$P_m \times P_n$ is called polar grids and $K_2 \times P_n$ is called Ladder.

The product$C_m \times P_n$ is called Grids on cylinder of order mn. In particular, $D_n = C_n \times K_2$ is called a prism and $B_m = K_{1,m} \times K_2$ is called a **book.**

Definition 2.5:

$\boldsymbol{K_{1,1,n}}$is a graph obtained by attaching root of a star $K_{1,n}$ at one end of P_2 and other end is joined with each pendant vertex of $K_{1,n}$.

3.Main Results:

Theorem 3.1.

Z-(P_n)is a V_4 Cordial graph.

Proof:

Let V(Z-(P_n))= { u_i , v_i: $1 \leq i \leq n$}.

Let E(Z-(P_n))= {$(u_i u_{i+1})$:$1 \leq i \leq n-1$}∪{$(v_i u_{i+1})$:$1 \leq i \leq n$}∪{$(v_i v_{i+1})$:$1 \leq i \leq n-1$}.

Define f : V(Z-(P_n)) → V_4 by

$$f(u_i) = \begin{cases} -1 & if\ i\ \equiv\ 0,3(mod\ 8) \\ -i & if\ i\ \equiv\ 1,6(mod\ 8) \\ i & if\ i\ \equiv\ 2,5(mod\ 8) \\ 1 & if\ i\ \equiv\ 4,7(mod\ 8) \end{cases} \quad ,\ 1 \leq i \leq n$$

$$f(v_i) = \begin{cases} -i & if\ i \equiv 0,3(mod\ 8) \\ 1 & if\ i \equiv 1,6(mod\ 8) \\ -1 & if\ i \equiv 2,5(mod\ 8) \\ i & if\ i \equiv 4,7(mod\ 8) \end{cases} \quad , 1 \le i \le n$$

The induced edge labelings are

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

$$f(v_i) * f(u_{i+1}) = \begin{cases} -1 & if\ i \equiv 0(mod\ 4) \\ i & if\ i \equiv 1(mod\ 4) \\ 1 & if\ i \equiv 2(mod\ 4) \\ -i & if\ i \equiv 3(mod\ 4) \end{cases} \quad , 1 \le i \le n-1$$

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

Vertex Conditions:

(i) $v_f(1) = v_f(i) = v_f(-i) = v_f(-1) = \frac{n}{2}$, when n ≡ 0(mod 2)

(ii) $v_f(1) = v_f(-i) = \frac{n+1}{2}$ and $v_f(i) = v_f(-1) = \frac{n-1}{2}$, when n ≡1(mod 8)

(iii) $v_f(1) = v_f(i) = \frac{n-1}{2}$ and $v_f(-i) = v_f(-1) = \frac{n+1}{2}$, when n ≡3(mod 8)

(iv) $v_f(1) = v_f(-i) = \frac{n-1}{2}$ and $v_f(i) = v_f(-1) = \frac{n+1}{2}$, when n ≡5(mod 8)

(v) $v_f(1) = v_f(i) = \frac{n+1}{2}$ and $v_f(-i) = v_f(-1) = \frac{n-1}{2}$,when n ≡7(mod 8)

Hence, $|v_f(a) - v_f(b)| \le 1$, ∀ a,b∈ V_4.

Edge Conditions:

(i) $e_f(i) = e_f(-1) = e_f(-i) = 3\left(\frac{n}{4} - 1\right) + 2$ and $e_f(1) = 3\left(\frac{n}{4} - 1\right) + 3$, when n ≡ 0(mod 4)

(ii) $e_f(1) = e_f(i) = e_f(-1) = e_f(-i) = 3\left(\frac{n-1}{4}\right)$, when n ≡ 1(mod 4)

(iii) $e_f(1) = e_f(i) = e_f(-1) = 3\left(\frac{n-2}{4}\right) + 1$ and $e_f(-i) = 3\left(\frac{n-2}{4}\right)$, when n ≡ 2(mod 4)

(iv) $e_f(1) = e_f(i) = 3\left(\frac{n-3}{4}\right) + 2$ and $e_f(-1) = e_f(-i) = 3\left(\frac{n-3}{4}\right) + 1$, when n ≡ 3(mod 4)

Hence, $|e_f(a) - e_f(b)| \le 1$, ∀ a,b∈ V_4.

Hence, Z-(P_n) is a V_4 Cordial Graph .

For example, the V_4 Cordial Labeling of Z-(P_3) , Z-(P_4), Z-(P_5), Z-(P_6), Z-(P_7) , Z-(P_9) are shown in Figures 3.1.1-3.1.6.

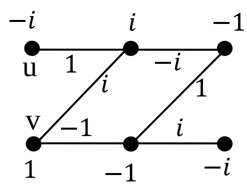

Figure 3.1.1

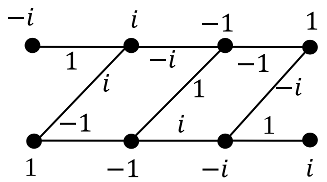

Figure 3.1.2

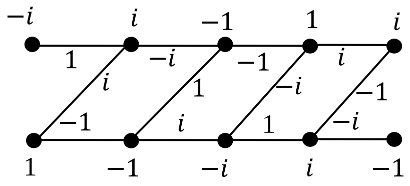

Figure 3.1.3

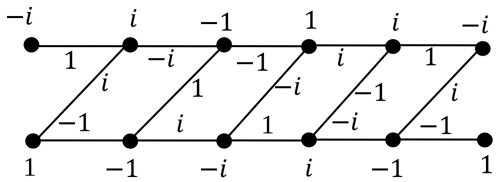

Figure 3.1.4

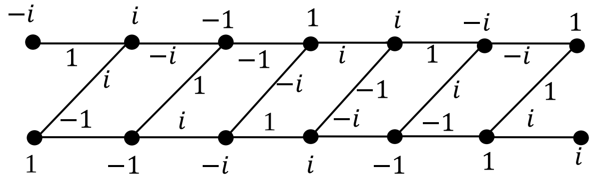

Figure 3.1.5

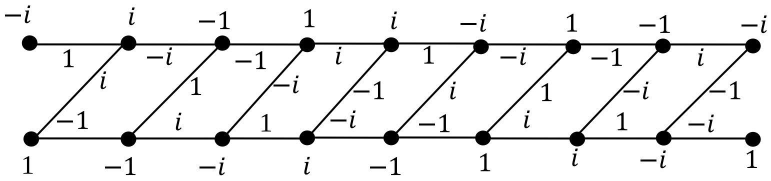

Figure 3.1.6

Theorem 3.2.

Book is a V_4 Cordial graph.

Proof:

Let (V(G)) = $\{u,\ w,\ v_i : 1 \le i \le n\}$.

Let (E(G)) = $\{(uv_i) : 1 \le i \le n\} \cup \{(wv_i) : 1 \le i \le n\}$.

Define $f : V(G) \to V_4$ by

Case(i): when n≡0 (mod 4)

Let f(u) = −1 , f(w)= 1

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

The induced edge labelings are

Let $f(u) * f(w) = -1$

$$f(u) * f(v_i) = \begin{cases} -1 & if\ i \equiv 0(mod\ 4) \\ i & if\ i \equiv 1(mod\ 4) \\ -i & if\ i \equiv 2(mod\ 4) \\ 1 & if\ i \equiv 3(mod\ 4) \end{cases} ,\ 1 \le i \le n$$

$$f(w) * f(v_i) = 1 = \begin{cases} 1 & if\ i \equiv 0(mod\ 4) \\ -i & if\ i \equiv 1(mod\ 4) \\ i & if\ i \equiv 2(mod\ 4) \\ -1 & if\ i \equiv 3(mod\ 4) \end{cases} ,\ 1 \le i \le n$$

Vertex Conditions:

Here, $v_f(1) = v_f(-1) = \frac{n}{4} + 1$ and $v_f(i) = v_f(-i) = \frac{n}{4}$.

Hence, $|v_f(a) - v_f(b)| \leq 1, \forall$ a,b$\in V_4$.

Edge Conditions:

Here, $e_f(1) = e_f(i) = e_f(-i) = \frac{n}{2}$ and $e_f(-1) = \frac{n}{2} + 1$.

Hence, $|e_f(a) - e_f(b)| \leq 1, \forall$ a,b$\in V_4$.

Hence, Book is a V_4 Cordial Graph .

For example, the V_4 Cordial Labeling of Book is shown in the Figure 3.2.1.

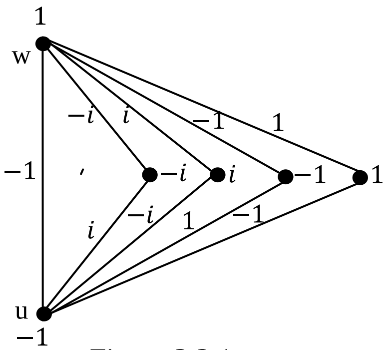

Figure 3.2.1

Case(ii): when n≡1 (mod 4)

Let f(u) = i , f(w)= -1

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

The induced edge labelings are

Let $f(u) * f(w) = -i$

$$f(u) * f(v_i) = \begin{cases} -i & if\ i \equiv 0 (mod\ 4) \\ i & if\ i \equiv 1 (mod\ 4) \\ 1 & if\ i \equiv 2 (mod\ 4) \\ -1 & if\ i \equiv 3 (mod\ 4) \end{cases} , 1 \leq i \leq n$$

$$f(w) * f(v_i) = \begin{cases} 1 & if\ i \equiv 0 (mod\ 4) \\ -1 & if\ i \equiv 1 (mod\ 4) \\ i & if\ i \equiv 2 (mod\ 4) \\ -i & if\ i \equiv 3 (mod\ 4) \end{cases} , \ 1 \leq i \leq n$$

Vertex Conditions:

Here, $v_f(1) = v_f(-1) = v_f(i) = \frac{n-1}{4} + 1$ and $v_f(-i) = \frac{n-1}{4}$.

Hence, $|v_f(a) - v_f(b)| \leq 1, \forall$ a,b$\in V_4$.

Edge Conditions:

Here, $e_f(1) = \frac{n-1}{2}$ and $e_f(i) = e_f(-1) = e_f(-i) = \frac{n-1}{2} + 1$.

Hence, $|e_f(a) - e_f(b)| \leq 1, \forall$ a,b$\in V_4$.

Hence, Book is a V_4 Cordial Graph .

For example, the V_4 Cordial Labelingof Book is shown in the Figure 3.2.2.

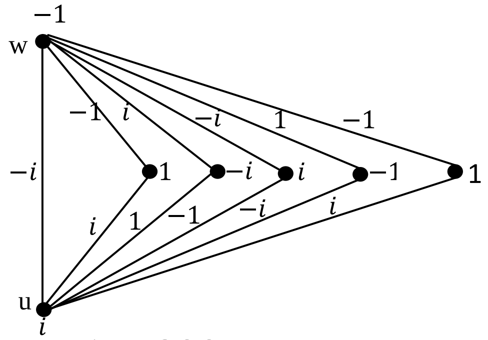

Figure 3.2.2.

Case(iii): when n≡2 (mod 4)

Let f(u) = i , f(w) = 1, f(v_n) = -1

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

The induced edge labelings are

Let $f(u) * f(w) = i$, $f(u) * f(v_n) = -i$ and $f(w) * f(v_n) = -1$

$$f(u) * f(v_i) = \begin{cases} -1 & if\ i\ \equiv\ 0(mod\ 4) \\ 1 & if\ i\ \equiv 1(mod\ 4) \\ i & if\ i\ \equiv\ 2(mod\ 4) \\ -i & if\ i\ \equiv\ 3(mod\ 4) \end{cases} \quad , 1 \leq i \leq n-1$$

$$f(w) * f(v_i) = \begin{cases} i & if\ i\ \equiv\ 0(mod\ 4) \\ -i & if\ i\ \equiv\ 1(mod\ 4) \\ 1 & if\ i\ \equiv\ 2(mod\ 4) \\ -1 & if\ i\ \equiv\ 3(mod\ 4) \end{cases} \quad ,\ 1 \leq i \leq n-1$$

Vertex Conditions:

Here,$v_f(1)$ =$v_f(-1)$ = $v_f(i) = v_f(-i) = = \frac{n-2}{4} + 1$.

Hence, $|v_f(a) - v_f(b)| \leq 1$, ∀ a,b∈ V_4.

Edge Conditions:

$e_f(1) = e_f(i) = e_f(-1) = \frac{n-2}{2} + 1$ and $e_f(-i) = \frac{n-2}{2} + 2$.

Hence, $|e_f(a) - e_f(b)| \leq 1$, ∀ a,b∈ V_4.

Hence, Book is a V_4 Cordial Graph .

For example, the V_4 Cordial Labelingof Book is shown in the Figure3.2.3.

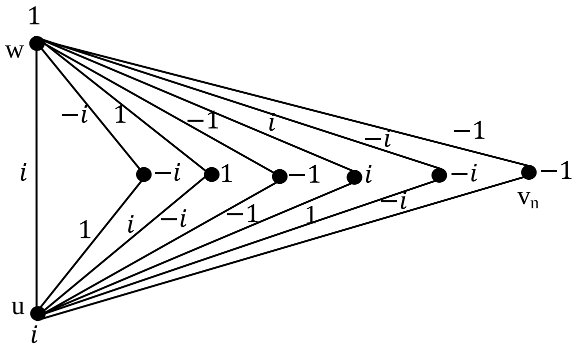

Figure 3.2.3

Case(iv): when n≡3(mod 4)

Let f(u) = 1 , f(w)= $-i$

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

The induced edge labelings are

Let $f(u) * f(w) = -i$

$$f(u) * f(v_i) = \begin{cases} -i & if\ i \equiv 0(mod\ 4) \\ i & if\ i \equiv 1(mod\ 4) \\ -1 & if\ i \equiv 2(mod\ 4) \\ 1 & if\ i \equiv 3(mod\ 4) \end{cases} \quad , 1 \leq i \leq n$$

$$f(w) * f(v_i) = = \begin{cases} -1 & if\ i \equiv 0(mod\ 4) \\ 1 & if\ i \equiv 1(mod\ 4) \\ i & if\ i \equiv 2(mod\ 4) \\ -i & if\ i \equiv 3(mod\ 4) \end{cases} \quad , 1 \leq i \leq n$$

Vertex Conditions:

Here,$v_f(1) = \frac{n+1}{4} + 1$ and$v_f(-1) = v_f(i) = v_f(-i) = = \frac{n+1}{4}$.

Hence, $|v_f(a) - v_f(b)| \leq 1$, ∀ a,b∈ V_4.

Edge Conditions:

Here, $e_f(1) = e_f(i) = e_f(-i) = \frac{n+1}{2}$ and $e_f(-1) = \frac{n+1}{2} - 1$.

Hence, $|e_f(a) - e_f(b)| \leq 1$, ∀ a,b∈ V_4.

Hence, Book is a V_4 Cordial Graph .

For example, the V_4 Cordial Labeling of Book is shown in the Figure3.2.4.

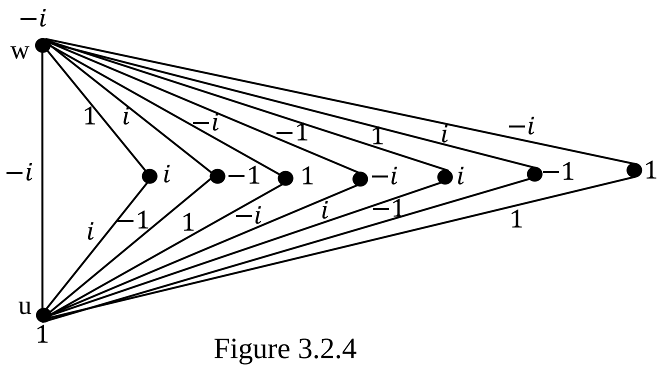

Figure 3.2.4

Theorem 3.3.

$K_{1,1,n}$is a V_4 Cordial graph .

Proof:

Let V($K_{1,1,n}$) $=\{u,\ v, v_i \colon 1 \le i \le n\}$.

Let E ($K_{1,1,n}$) = {(uv) : $1 \le i \le n\}\cup\{$(uv$_i$) : $1 \le i \le n\}\cup$ {(vv$_i$) : $1 \le i \le n\}$.

Define f : V($K_{1,1,n}$) → V_4 by

Case(i): when n≡0 (mod 4)

Let f(u) = −1 , f(v)= 1

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

The induced edge labelings are

Let f(u) ∗ f(v) = −1

$$f(u) * f(v_i) = \begin{cases} -1 & if\ i\ \equiv\ 0(mod\ 4) \\ 1 & if\ i\ \equiv 1(mod\ 4) \\ -i & if\ i\ \equiv\ 2(mod\ 4) \\ i & if\ i\ \equiv\ 3(mod\ 4) \end{cases} \quad , 1 \le i \le n$$

$$f(v) * f(v_i) = \begin{cases} 1 & if\ i\ \equiv\ 0(mod\ 4) \\ -1 & if\ i\ \equiv 1(mod\ 4) \\ i & if\ i\ \equiv\ 2(mod\ 4) \\ -i & if\ i\ \equiv\ 3(mod\ 4) \end{cases} \quad , 1 \le i \le n$$

Vertex Conditions:

Here,$v_f(1)$ =$v_f(-1)$ =$\frac{n}{4}+1$ and $v_f(i) = v_f(-i)$= $\frac{n}{4}$.

Hence, $|v_f(a) - v_f(b)| \le 1$, ∀ a,b∈ V_4.

Edge Conditions:

Here, $e_f(1)$ = $e_f(i)$ =$e_f(-i)$ = $\frac{n}{2}$and $e_f(-1)$=$\frac{n}{2}+1$.

Hence, $|e_f(a) - e_f(b)| \le 1$, ∀ a,b∈ V_4 .

Hence, $K_{1,1,n}$ is a V_4 Cordial Graph .

For example, the V_4 Cordial Labeling of $K_{1,1,4}$ is shown in the Figure 3.3.1.

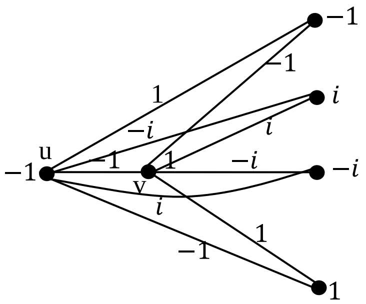

Figure 3.3.1

Case(ii): when n≡1 (mod 4)

Let f(u) = i , f(v) = 1

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

The induced edge labelings are

Let $f(u) * f(v) = i$

$$f(u) * f(v_i) = \begin{cases} i & if\ i \equiv 0 (mod\ 4) \\ -i & if\ i \equiv 1 (mod\ 4) \\ -1 & if\ i \equiv 2 (mod\ 4) \\ 1 & if\ i \equiv 3 (mod\ 4) \end{cases} \quad , 1 \le i \le n$$

$$f(v) * f(v_i) = \begin{cases} 1 & if\ i \equiv 0 (mod\ 4) \\ -1 & if\ i \equiv 1 (mod\ 4) \\ i & if\ i \equiv 2 (mod\ 4) \\ -i & if\ i \equiv 3 (mod\ 4) \end{cases} \quad , 1 \le i \le n$$

Vertex Conditions:

Here, $v_f(1) = v_f(-1) = v_f(i) = \frac{n-1}{4} + 1$ and $v_f(-i) = \frac{n-1}{4}$.

Hence, $|v_f(a) - v_f(b)| \le 1$, ∀ a,b∈ V_4.

Edge Conditions:

Here, $e_f(1) = \frac{n-1}{2}$ and $e_f(i) = e_f(-1) = e_f(-i) = \frac{n+1}{2}$.

Hence, $|e_f(a) - e_f(b)| \le 1$, ∀ a,b∈ V_4.

Hence, $K_{1,1,n}$ is a V_4 Cordial Graph .

For example, the V_4 Cordial Labeling of $K_{1,1,5}$ is shown in the Figure3.3.2.

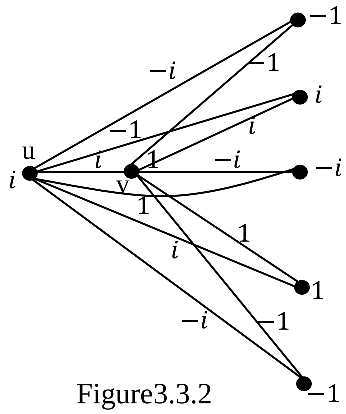

Figure3.3.2

Case(iii): when n≡2 (mod 4)

Let f(u) = $-i$, f(v) = 1

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

The induced edge labelingare

Let f$(u) *$ f(v) = $-i$

$$f(u) * f(v_i) = \begin{cases} -i & if\ i\ \equiv\ 0(mod\ 4) \\ i & if\ i\ \equiv 1(mod\ 4) \\ 1 & if\ i\ \equiv\ 2(mod\ 4) \\ -1 & if\ i\ \equiv\ 3(mod\ 4) \end{cases},\ 1 \le i \le n$$

$$f(v) * f(v_i) = \begin{cases} 1 & if\ i\ \equiv\ 0(mod\ 4) \\ -1 & if\ i\ \equiv 1(mod\ 4) \\ i & if\ i\ \equiv\ 2(mod\ 4) \\ -i & if\ i\ \equiv\ 3(mod\ 4) \end{cases},\ 1 \le i \le n$$

Vertex Conditions:

Here,$v_f(1)$ =$v_f(-1)$ = $v_f(i) = v_f(-i)$ =$\frac{n-2}{4} + 1$.

Hence, $|v_f(a) - v_f(b)| \le 1$, ∀ a,b∈ V_4.

Edge Conditions:

(i)$e_f(1)$ = $e_f(-i)$ =$e_f(-1)$ = $\frac{n}{2}$ and $e_f(i)$= $\frac{n+2}{2}$.

Hence, $|e_f(a) - e_f(b)| \le 1$, ∀ a,b∈ V_4.

Hence, $K_{1,1,n}$ is a V_4 Cordial Graph .

For example, the V_4 Cordial Labeling of $K_{1,1,6}$ is shown in the

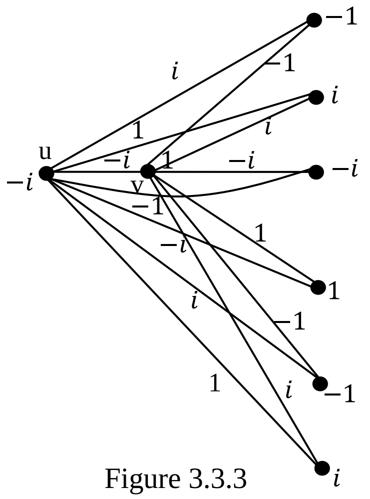

Figure 3.3.3

Figure3.3.3.

Case(iv): when n≡3 (mod 4)

Let f(u) = 1 , f(v) = 1

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

The induced edge labelings are

Let f$(u) *$ f(v) = 1

$$f(u) * f(v_i) = \begin{cases} 1 & if\ i \equiv 0(mod\ 4) \\ -1 & if\ i \equiv 1(mod\ 4) \\ i & if\ i \equiv 2(mod\ 4) \\ -i & if\ i \equiv 3(mod\ 4) \end{cases}, 1 \le i \le n$$

$$f(u) * f(v_i) = \begin{cases} 1 & if\ i \equiv 0(mod\ 4) \\ -1 & if\ i \equiv 1(mod\ 4) \\ i & if\ i \equiv 2(mod\ 4) \\ -i & if\ i \equiv 3(mod\ 4) \end{cases}, 1 \le i \le n$$

Vertex Conditions:

Here,$v_f(1) = \frac{n+1}{4} + 1$ and $v_f(-1) = v_f(i) = v_f(-i) = \frac{n+1}{4}$.

Hence, $|v_f(a) - v_f(b)| \le 1$, ∀ a,b∈ V_4.

Edge Conditions:

Here, $e_f(i) = e_f(-1) = e_f(-i) = \frac{n+1}{2}$ and $e_f(1) = \frac{n-1}{2}$.

Hence, $|e_f(a) - e_f(b)| \le 1$, ∀ a,b∈ V_4.

Hence,$K_{1,1,n}$ is a V_4 Cordial Graph .

For example, the V_4 Cordial Labeling of $K_{1,1,7}$ is shown in the Figure3.3.4.

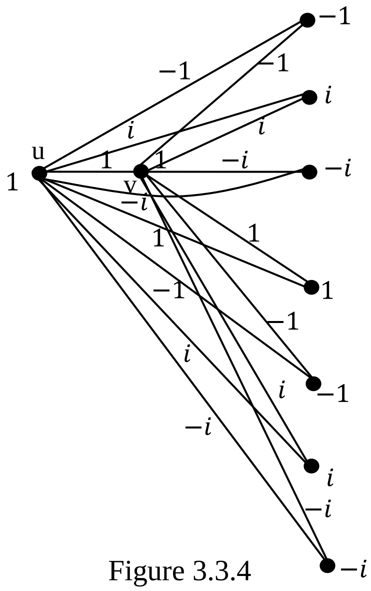

Figure 3.3.4

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