Corona Graphs for Astronomical Calculations using L-Cordial Labeling

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I. INTRODUCTION

For our study we use the graph $G = (p,q)$ which are finite, simple and undirected. Initially L-Cordial Labeling (LCL) was introduced in [7] and proved some graphs for the same labeling in [8,9] LCL. In [2,3] et al proved cube $Q_1$, octahedron and special graph admits LCL. H-Related graph for square difference, Prime cordial and Cube difference labeling were studied in [1,6,14]. In [15] Veena Shinde-Deorde, studied H-Cordial and prime labeling. In [10,11,12,13] Ponraj et.al proved snake graph and there corona admits difference cordial labeling. Detailed survey descriptions are given in [4]. Condition and results follow from [5] In this work we prove corona for some special graphs admits L-Cordial labeling.

II. PRELIMINARIES

1. If there is a bijection function $f:E(G) \rightarrow \{1,2,\ldots,|E|\}$, thus the vertex label is induced as 0 if the biggest label on the incident edges is even and is induced as 1, if it is odd and follows the condition that $|V_f(1) - V_f(1)| \leq 1$.

Isolated vertices are not included for labeling here. A L-cordial graph is a graph which admits the above labeling.

2. The corona $AOB$ graph $G$ is formed by taking one copies of $A$ (which has $p$ points) $p$ copies of $B$ and then attaching the $i^{th}$ point of $A$ to every point in the $i^{th}$ copy of $B$.

Theorem 1:

$T_n \Theta K_1$ admits L-Cordial Labeling.

Proof:

Consider $G = T_n \Theta K_1$ with $V = \{u_i, x_i, y_i, w_i / i = 1,2,\ldots,n\}$ and $E = \{u_i, x_i / 1 \leq i \leq n\} \cup \{u_i, x_i, w_i, y_i / 1 \leq i \leq n - 1\}$ respectively.

The edge labeling is given as

$$
\begin{align*}
\text{For } i=1, 2\ldots n-1 & \\
g(w_i, u_{i+1}) &= 4n + i - 3 \\
g(u_i, w_i) &= 2n + i - 1 \\
g(w_i, y_i) &= n + i \\
g(u_i, w_i) &= 3n + i - 2
\end{align*}
$$

Thus we have the vertex distribution as $V_g(0) = V_g(1)$ for all $n$. Hence it’s clear that $T_n \Theta K_1$ admits L-Cordial Labeling. Illustration of $T_2 \Theta K_1$ is given in Figure below.

Theorem 2:

$DT_n \Theta K_1$ is L-Cordial graph.

Proof:

Consider the graph $G = DT_n \Theta K_1$ with $V(DT_n \Theta K_1) = \{x_j, y_j, 1 \leq j \leq n\} \cup \{w_j, y_j, y_j' / 1 \leq j \leq n - 1\}$ and $E(DT_n \Theta K_1) = \{x_j, w_j', y_j, x_{j+1}, y_j, y_j' / 1 \leq j \leq n - 1\}$.

We state the labeling $f : E(G) \rightarrow \{1,2,\ldots,n \}$ as

When $n$ odd

$$
\begin{align*}
\text{For } j=1, 2,\ldots, n-1 & \\
f(w_j, w_{j+1}) &= 2j \\
f(x_j, x_{j+1}) &= 2n - 2 + j \\
f(y_j, y_{j+1}) &= 6n - 5 + j \\
f(x_j, y_j) &= 4n + j - 3 \\
f(w_j, w_{j+1}) &= 7n - 6 + j \\
f(x_j, w_j) &= 5n + j - 4
\end{align*}
$$

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For $j = 1, 2, ..., n$
\[ f(x, x_j) = 3n - 3 + j \]

When $n$ is even
\[
\begin{align*}
\text{For } 1 \leq j \leq n - 1 & \\
f(x, x_{j+1}) &= 3n - 3 + j \\
f(x, y) &= j \\
f(x, x_j) &= n + j - 1 \\
f(x, x_{j+1}) &= 4n - 4 + j \\
f(y, x_{j+1}) &= 2n - 2 + j \\
f(w, y_j) &= 5n + 2j - 5 \\
f(y, y_j) &= 5n + 2j - 6
\end{align*}
\]

For $i = 1, 2, ..., n$
\[ f(x, x_j) = 7n - 7 + j \]

Therefore from the above labeling it is clear that $V_f(0) = V_f(1) = 3n - 2$ for all $n$. Thus $DT_4OK_2$ is L-Cordial Graph. Illustration of $DT_4OK_2$ is given in Figure below.

\[\text{Theorem 3:}\]
The Graph $Q_nOK_2$ is LC.

\[\text{Proof:}\]
Let $G = Q_nOK_2$ a graph with $V = \{a, b, c, e_j / j = 1, 2, ..., n - 1\}$ and $E = \{a, d, j, j = 1, 2, ..., n\}$ and
\[ E = \{b, e_j, a, a, a, j, c, e_2, a, b, c, a, j + 1\} \quad \text{For } j = 1, 2, ..., n \]

Then we represent a one to one and onto function $f : E \rightarrow \{1, 2, ..., q\}$ as
\[
\begin{align*}
\text{For } j &= 1, 2, ..., n \\
f(a, d) &= 3n - 3 + j \\
f(b, e_j) &= n + 2j - 2 \\
f(c, e_2) &= n + 2j - 1 \\
f(a, a, j + 1) &= j \\
f(a, b_j) &= 5n - 4 + j \\
f(c, a, j + 1) &= 6n + 5 - 5
\end{align*}
\]

Then it is easily observed that the above function satisfies the condition of L-Cordial Labeling.

Therefore $Q_nOK_2$ admits L-Cordial Labeling. Illustration of $Q_nOK_2$ is given in Figure below.

**Theorem 4:**
$B_{nn}OK_2$ admits LCL.

**Proof:**
Let $G = B_{nn}OK_2$ be a graph with $V(G) = \{x, y, u_i, v_i, u_i, v_i, x, y / 1 \leq i \leq n\}$ and $E(G) = \{xy, xx', yy', uu_i, vv_i, u_iu_i, v_iv_i / 1 \leq i \leq n\}$

Then the edge labeling is given by
\[
\begin{align*}
f(x) &= 1, f(xx') = 2, f(y, y') = 3 \\
f(x, u_i) &= 2 + 2i \\
f(y, v_i) &= 3 + 2i \\
f(u_i, u_i') &= 2n + 2i + 2 \\
f(v_i, v_i') &= 2n + 2i + 3
\end{align*}
\]

It is clear from the above defined labeling that $V_f(0) = V_f(1)$ for all $n$. Hence $B_{nn}OK_2$ admits LCL.

**Theorem 5:**
Graph $C_mOP_n$ is L-Cordial graph.

**Proof:**
Let $G = C_mOP_n$ with $V(G) = \{x, y / 1 \leq i \leq m, 1 \leq j \leq n\}$ and $E(G) = \{x_i, y_i / 1 \leq i \leq m - 1\}$

We define $f$ from $1, 2, ..., q$ as
\[ f(x, x_{i+1}) = mn - m + i, 1 \leq i \leq m - 1 \]

\[ f(y, y_{i+1}) = i + m(j - 1), 1 \leq i \leq m, 1 \leq j \leq n - 1 \]

Hence $C_mOP_n$ has $V_f(0) - V_f(1) \leq 1$ vertex. Thus $C_mOP_n$ is LCG.

### III. Conclusion

In this paper we examined the determination of $L$-cordial behavior of $T_{nn}OK_2, DT_{nn}OK_2, Q_nOK_2, B_{nn}OK_2, C_mOP_n$.
REFERENCES


AUTHORS PROFILE

J. Arthy is an Assistant Professor, Department of Science and Humanities BHHER, Chennai. She is currently working on Graph labeling. She published 7 papers in international journal.