1. Introduction:
A graph $G$ is a finite non-empty set of objects called vertices together with a set of unordered pairs of distinct vertices of $G$ which is called edges. Each pair $e = (uv)$ of vertices in $E$ is called an edge or a line of $G$. In this paper, we proved that every shadow graph is a cordial graph and that every shadow graph is a Resideo cordial graph.

2. Preliminaries:
A cordial labeling of a graph $G$ with vertex set $V$ is a bijection from $V$ to $\{0, 1\}$ such that if each edge $uv$ is assigned the label $(f(u)+f(v)) \pmod{2}$ the number of vertices labeled with 0 and the number of vertices labeled with 1 differ by at most 1 and the number of edges labeled with 0 and the number of edges labeled with 1 differ by at most 1. A graph which admits Resideo cordial labeling is the Resideo cordial graph.

A Resideo cordial labeling of a graph $G$ with vertex set $V$ is a bijection from $V$ to $\{0, 1\}$ such that if each edge $uv$ is assigned the label $(|f(u)-f(v)|)$ the number of vertices labeled with 0 and the number of vertices labeled with 1 differ by at most 1 and the number of edges labeled with 0 and the number of edges labeled with 1 differ by at most 1. A graph which admits cordial labeling is the cordial graph.

3. Main Results
Theorem 3.1
Every shadow graph is a cordial graph. (OR) For any graph $G$, $D_2(G)$ is cordial.

Proof:
Let $G = (V, E)$ be a connected graph.
Let $|V(G)| = p$ and $|E(G)| = q$.
Let $G_1$ and $G_2$ be two copies of $G$.
Let $V(G_1) = \{u_i : 1 \leq i \leq p\}$ and $V(G_2) = \{v_i : 1 \leq i \leq p\}$.
Let $E(G_1) = \{u_i u_j : 1 \leq i, j \leq p\}$ and $E(G_2) = \{v_i v_j : 1 \leq i, j \leq p\}$.
Let $D_2(G)$ be the shadow graph of $G$.

Then $V(D_2(G)) = \{u_i, v_i : 1 \leq i \leq p\}$ and $E(D_2(G)) = \{(u_i v_j) : 1 \leq i, j \leq p\}$.
Define $f : V(D_2(G)) \rightarrow \{0, 1\}$ by
$f(u_i) = 0, 1 \leq i \leq p$.
$f(v_i) = 1, 1 \leq i \leq p$.

Then by definition, every edge $e = u_i v_j$ in $G$, the induced edge labeling is,
$f(e) = \begin{cases} 0 & \text{if } e \in E_1(G) \\ 1 & \text{if } e \in E_2(G) \end{cases}$

Further in $G_1$, the induced edge labeling $f(v_i v_j) = 0, 1 \leq i, j \leq p$.
In $G_2$, $f(v_i v_j) = 1, 1 \leq i, j \leq p$.

Hence $D_2(G)$ is cordial.

Theorem 3.3
Every shadow graph is a Resideo cordial graph. (OR) For any graph $G$, $D_2(G)$ is Resideo cordial.

Proof:
Let $G = (V, E)$ be a connected graph.
Let $|V(G)| = p$ and $|E(G)| = q$.
Let $G_1$ and $G_2$ be two copies of $G$.
Let $V(G_1) = \{u_i : 1 \leq i \leq p\}$ and $V(G_2) = \{v_i : 1 \leq i \leq p\}$.
Let $E(G_1) = \{u_i u_j : 1 \leq i, j \leq p\}$ and $E(G_2) = \{v_i v_j : 1 \leq i, j \leq p\}$.
Let $D_2(G)$ be the shadow graph of $G$.

Then $V(D_2(G)) = \{u_i, v_i : 1 \leq i \leq p\}$ and $E(D_2(G)) = \{(u_i v_j) : 1 \leq i, j \leq p\}$.
Define $f : V(D_2(G)) \rightarrow \{0, 1\}$ by
$f(u_i) = 0, 1 \leq i \leq p$.
$f(v_i) = 1, 1 \leq i \leq p$.

For example the cordial labeling of $D_2(P_3)$ as shown in figure 3.2.

Figure 3.2: $D_2(P_3)$
Then by definition, every edge, \( e = u_i u_j \) (\( i \neq j \)) in \( G_1 \) the induced edge labeling is,

\[
f^*(u_i u_j) = 0 ; \ 1 \leq i,j \leq p.
\]

and for every edge \( e = v_i v_j \) (\( i \neq j \)) in \( G_2 \) the induced edge labeling is

\[
f^*(v_i v_j) = 0 ; \ 1 \leq i,j \leq p.
\]

Further in \( G_1 \), \( v_i(0) = p \), \( v_i(1) = 0 \),

\( e_i(0) = q \), \( e_i(1) = 0 \).

In \( G_2 \), \( v_i(0) = 0 \), \( v_i(1) = p \)

\( e_i(0) = q \), \( e_i(1) = 0 \).

In \( D_2(G) \),

For every edge \( e = u_i v_j \), the induced edge labeling \( f^*(u_i v_j) = 1 ; 1 \leq i,j \leq p \)

\( e_i(0) = 0 \)

\( e_i(1) = 2q \).

Therefore, in \( D_2(G) \),

\( v_i(0) = p \), \( v_i(1) = p \), \( e_i(0) = 2q \), \( e_i(1) = 2q \).

And \( |v_i(0) - v_i(1)| = 0 \).

\( |e_i(0) - e_i(1)| = 0 \).

Hence \( D_2(G) \) is Resideo cordial.

For example the Resideo cordial labeling of \( D_2(C_3) \) is shown in figure 3.4.

**Figure : 3.4 : \( D_2(C_3) \)**

**REFERENCE**