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# Cycle Related Analytic Mean Square-Cordial Graphs

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**Abstract :** Let $G = (V, E)$ be a graph with p vertices and q edges. A Analytic Mean Square-Cordial Labeling of a Graph G with vertex set V is a bijection from V to {0,1} such that each edge $uv$ is assigned the label $f(uv) = |[f(u)^2 - f(v)^2/2]|$ with the condition that the number of vertices labeled with 0 and the number of vertices labeled with 1 differ by atmost 1 and the number of edges labeled with 0 and the number of edges labeled with 1 differ by atmost 1. The graph that admits a Analytic Mean Square-Cordial Labeling is called Analytic Mean Square-Cordial Graph. In this paper, we proved that cycle related graphs Cycle $C_n$, Double Quadrilateral Snake $DQ_n$ are Analytic Mean Square-Cordial Graphs.

*Keywords* – Cycle, Double Quadrilateral Snake, Analytic Mean Square-Cordial Graph, Analytic Mean Square-Cordial Labeling.

2000 Mathematics Subject classification 05C78.

## I.Introduction

A Graph G is a finite nonempty 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 edges or a line of G. In this paper, we proved that cycle related graphs Cycle $C_n$, Double Quadrilateral Snake $DQ_n$ are Analytic Mean Square-Cordial Graphs.For graph theory terminology, we follow [2].

## II.Preliminaries

Let $G = (V, E)$ be a graph with p vertices and q edges. A Analytic Mean Square-Cordial Labeling of a Graph G with vertex set V is a bijection from V to {0,1} such that each edge $uv$ is assigned the label $f(uv) = |[f(u)^2 - f(v)^2/2]|$ with the condition that the number of vertices labeled with 0 and the number of vertices labeled with 1 differ by atmost 1 and the number of edges labeled with 0 and the number of edges labeled with 1 differ by atmost 1.

The graph that admits a Analytic Mean Square-Cordial Labeling is called Analytic Mean Square-Cordial Graph. In this paper, we proved that cycle related graphs Cycle $C_n$, Double Quadrilateral Snake $DQ_n$ are Analytic Mean Square-Cordial Graphs.

**Definition: 2.1**

A Closed path is called a cycle and a cycle of length n is denoted by $C_n$.

**Definition: 2.2**

A Double Quadrilateral Snake is obtained from the path $(v_1, v_2, \ldots, v_n)$ by replacing every edge by2$C_4$. It is denoted by $DQ_{n-1}$.

**III. Main Results**

**Theorem: 3.1**

Cycle $C_n$ is Analytic Mean Square-Cordial Graph.

**Proof:**

Let $V(C_n) = \{[u_i: 1 \leq i \leq n]\}$ and

$E(C_n) = \{[(u_i u_{i+1}): 1 \leq i \leq n-1] \cup [(u_1 u_n)]\}$.

Define $f: V(C_n) \rightarrow \{0,1\}$.

The vertex labeling are,

$$f(u_i) = \begin{cases} 0 & i \equiv 1 \bmod 2 \\ 1 & i \equiv 0 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

The induced edge labelling are,

$$f^*[(u_i u_{i+1})] = \begin{cases} 0 & i \equiv 1 \bmod 2 \\ 1 & i \equiv 0 \bmod 2 \end{cases} \quad 1 \leq i \leq n-1$$

$$f^*[(u_n u_1)] = \begin{cases} 0 & n \equiv 1 \bmod 2 \\ 1 & n \equiv 0 \bmod 2 \end{cases}$$

When n = 2m+1, m>0

$v_f(0) = \frac{n+1}{2}$

$v_f(1) = \frac{n-1}{2}$ and

$e_f(0) = \frac{n+1}{2}$

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

When n = 2m+2, m≥0

$v_f(0) = v_f(1) = \frac{n}{2}$ and

$e_f(0) = e_f(1) = \frac{n}{2}$.

Therefore, Cycle$C_n$ satisfies the conditions $|v_f(0) - v_f(1) \leq 1|$ and $|e_f(0) - e_f(1) \leq 1|$.

Hence, Cycle $C_n$ is Analytic Mean Square-Cordial Graph.

For example, the Analytic Mean Square-Cordial Labeling of $C_6$ is shown in figure 3.2.

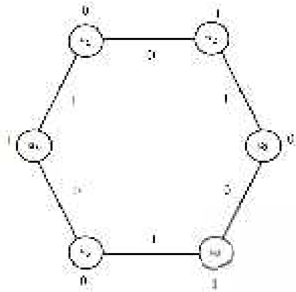

Figure 3.2:$C_6$

**Theorem: 3.2**

Double Quadrilateral Snake$DQ_n$ is Analytic Mean Square-Cordial Graph

**Proof:**

Let $V(DQ_n) = \{[u_i: 1 \leq i \leq n+1], [u_{i1}, u_{12}, u_{13}, u_{i4}: 1 \leq i \leq n]\}$ and

$$E(DQ_n) = \{[(u_i u_{i+1}) \cup (u_i u_{i1}) \cup (u_{i1} u_{i2}) \cup (u_{i2} u_{i+1}) \cup (u_{i+1} u_{i4}) \cup (u_{i4} u_{i3}) \cup (u_{i3} u_i): 1 \leq i \leq n]\}$$

Define $f: V(DQ_n) \rightarrow \{0,1\}$.

The vertex labeling are,

$$f(u_i) = \begin{cases} 0 & i \equiv 0 \bmod 2 \\ 1 & i \equiv 1 \bmod 2 \end{cases} \quad 1 \leq i \leq n+1$$

$$f(u_{i1}) = \begin{cases} 0 & i \equiv 1 \bmod 2 \\ 1 & i \equiv 0 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f(u_{i2}) = \begin{cases} 0 & i \equiv 0 \bmod 2 \\ 1 & i \equiv 1 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f(u_{i3}) = \begin{cases} 0 & i \equiv 1 \bmod 2 \\ 1 & i \equiv 0 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f(u_{i4}) = \begin{cases} 0 & i \equiv 0 \bmod 2 \\ 1 & i \equiv 1 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

The induced edge labelling are,

$$f^*[(u_i u_{i+1})] = \begin{cases} 0 & i \equiv 0 \bmod 2 \\ 1 & i \equiv 1 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f^*[(u_i u_{i1})] = \begin{cases} 0 & i \equiv 0 \bmod 2 \\ 1 & i \equiv 1 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f^*[(u_{i1} u_{i2})] = \begin{cases} 0 & i \equiv 1 \bmod 2 \\ 1 & i \equiv 0 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f^*[(u_{i2} u_{i+1})] = \begin{cases} 0 & i \equiv 0 \bmod 2 \\ 1 & i \equiv 1 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f^*[(u_{i+1} u_{i4})] = \begin{cases} 0 & i \equiv 1 \bmod 2 \\ 1 & i \equiv 0 \bmod 2 \end{cases} \quad 1 \leq i \leq n$$

$$f^*[(u_{i4}u_{i3})] = \begin{cases} 0 & i \equiv 0 \bmod 2 \\ 1 & i \equiv 1 \bmod 2 \end{cases} \quad 1 \le i \le n$$

$$f^*[(u_{i3}u_i)] = \begin{cases} 0 & i \equiv 1 \bmod 2 \\ 1 & i \equiv 0 \bmod 2 \end{cases} \quad 1 \le i \le n$$

When n = 2m, m>0

$v_f(0)$ = 5m, m>0

$v_f(1)$ = 5m+1, m>0 and

$e_f(0) = e_f(1)$ = 7m, m>0

When n = 2m-1, m>0

$v_f(0) = v_f(1)$ = 5m-2, m>0and

$e_f(0)$ = 7m-4, m>0

$e_f(1)$ = 7m-3,m>0

Therefore, Double Quadrilateral Snake $DQ_n$ satisfies the conditions $|v_f(0) - v_f(1)| \le 1|$ and $|e_f(0) - e_f(1)| \le 1|$.

Hence, Double Quadrilateral Snake $DQ_n$ is a Analytic Mean Square-Cordial Graph.

For example, the Analytic Mean Square-Cordial Labeling of $DQ_3$ is shown in figure 3.2.

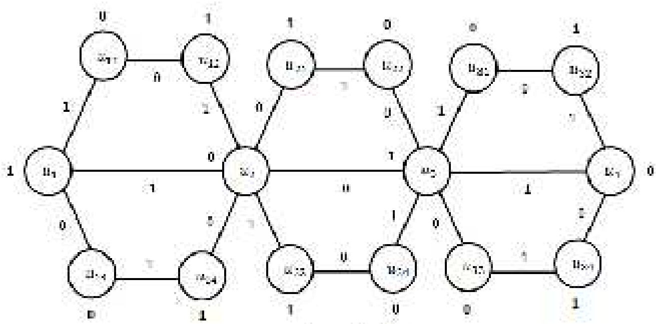

Figure 3.2 $DQ_3$

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