

# MALANKARA CATHOLIC COLLEGE

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu)  
Mariagiri, Kaliakkavilai, Kanyakumari District - 629153

Tamil Nadu, India

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PG & RESEARCH DEPARTMENT OF MATHEMATICS

## MACMAS-23

### NATIONAL CONFERENCE ON "ADVANCES IN GRAPH THEORY"

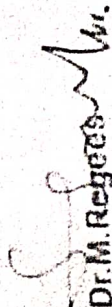


This is to certify that **Mr/Ms/Dr. K. CHINJU KRISHNA**, ASSISTANT PROFESSOR,

**MUSLIM ARTS COLLEGE, THIRUVITHANCODE**.....has participated/presented a paper  
entitled **STAR RELATED EVEN SUM GRAPHS**.....

in the National Conference on "ADVANCES IN GRAPH THEORY" organized by PG & Research  
Department of Mathematics, Malankara Catholic College in association with Kerala Mathematical

Association held on 3<sup>rd</sup> March 2023.

  
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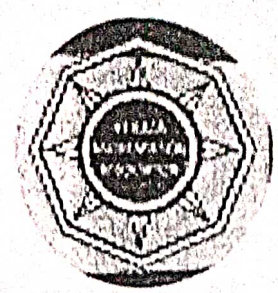
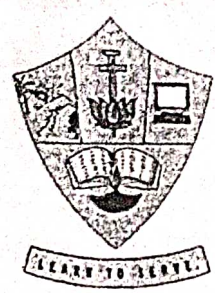
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3<sup>rd</sup> March 2023



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## STAR RELATED EVEN SUM GRAPHS

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### Abstract

A sum graph is a graph for which there is a labeling of its vertices with distinct positive integers so that two vertices are adjacent if and only if the sum of their labels is the label of another vertex. Integral sum graphs are defined similarly, except that the labels may be any integers. The concept of Even Sum Graphs was introduced by Chinju Krishna K, et al. A graph  $G$  is called an even sum graph if there is a labelling  $\eta$  of its vertices with distinct non-negative even integers, so that for any two distinct vertices  $a$  and  $b$ ;  $ab$  is an edge of  $G$  if and only if  $\eta(a) + \eta(b) = \eta(c)$  for some vertex  $w$  in  $G$ . The minimum number of isolated vertices required to make the graph  $G$ , an even sum graph is called the even sum number of  $G$  and is denoted by  $\gamma(G)$ .

**Keywords :** even sum graph, even sum number, star, bistar, cycle.

**Subject Classification :** 05C05, 05C70, 05C75, 05C78

### 1. Introduction

The concept of Sum Graphs and Integral Sum Graphs was introduced by F. Harary [14]. The properties of Sum Graphs are investigated by many authors, including Chen. Z [1], Mary Florida. L [17], Nicholas. T [15, 16], Soma Sundaram. S [15], Vilfred.V [16 - 20], Surya Kala.V [18, 19] and Rubin Mary. K [19, 20]. Inspired by the concepts of Sum Graphs and Integral Sum Graphs, Chinju Krishna. K, et al. introduced Even Sum Graphs. In this paper we investigated different types of Star Related Even Sum Graphs [ 2 - 11]. For all basic ideas, we refer [12, 13 ].

Bistar  $B_{n,n}$  is the graph obtained by joining the center ( apex) vertex of two copies of  $K_{1,n}$ . A graph  $\langle C_n, K_{1,m} \rangle$  where  $m \geq 1$  is obtained by attaching the central vertex of a star graph  $K_{1,m}$  to a vertex of a cycle  $C_n$ .

### 2. Main Results

**Theorem: 3.1.**  $B_{n,n}$  is an even sum graph.

**Proof:** Let  $a_{ij}, 1 \leq i \leq 2, 1 \leq j \leq n$  be the vertices of two copies of  $K_{1,n}$  with the central vertices  $b_i, 1 \leq i \leq 2$ . Join the central vertices by an edge. The resultant graph is  $B_{n,n}$ . Define a function  $\eta: V(B_{n,n}) \rightarrow 2Z^+ \cup \{0\}$  by  $\eta(b_1) = 2; \eta(a_{1,1}) = 4; \eta(a_{1,j}) = \eta(a_{1,j-1}) + \eta(b_1), 2 \leq j \leq n; \eta(b_2) = 0;$

$\eta(a_{2,1}) = \eta(a_{1n}) + \eta(b_2)$ ;  $\eta(a_{2,j}) = \eta(a_{2,(j-1)}) + 2$ ,  $2 \leq j \leq n$ . Then the labels are distinct and for any edge  $ab$  in  $B_{n,n}$ , the condition  $\eta(a) + \eta(b) = \eta(c)$  holds for some vertex  $c$  in  $G$ . Hence  $B_{n,n}$  is an even sum graph.

**Example: 3.2.** An even sum graph of  $B_{6,6}$  is shown in the Figure 3.1.

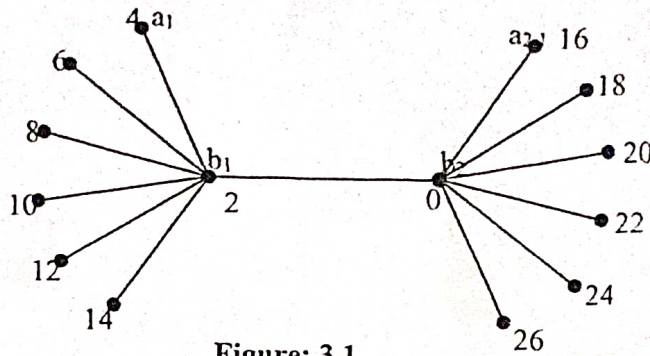


Figure: 3.1

**Theorem: 3.3.**  $\langle C_n, K_{1,m} \rangle$  is an even sum graph.

**Proof:** Let  $a_1 a_2 \dots a_n a_1$  be the cycle  $C_n$  and let  $b_1, b_2, \dots, b_m, c$  be the vertices of  $K_{1,m}$  where  $c$  is the central vertex. Identify  $a_1$  with  $c$ . The resultant graph is  $\langle C_n, K_{1,m} \rangle$ . Define a function  $\eta: V(\langle C_n, K_{1,m} \rangle) \rightarrow 2\mathbb{Z}^+ \cup \{0\}$  by  $\eta(a_1) = 0$ ;  $\eta(a_2) = 2$ ;  $\eta(a_3) = 4$ ;  $\eta(a_i) = \eta(a_{i-2}) + \eta(a_{i-1})$ ,  $4 \leq i \leq n$ ;  $\eta(b_1) = \eta(a_{n-1}) + \eta(a_n)$ ;  $\eta(b_i) = \eta(b_{i-2}) + 2$ ,  $2 \leq i \leq m$ . Then the labels are distinct and for any edge  $ab$  in  $\langle C_n, K_{1,m} \rangle$ , the condition  $\eta(a) + \eta(b) = \eta(c)$  holds for some vertex  $c$  in  $G$ . Hence  $\langle C_n, K_{1,m} \rangle$  is an even sum graph.

**Example: 3.4.** An even sum graph of  $\langle C_6, K_{1,5} \rangle$  is shown in the Figure 3.2.

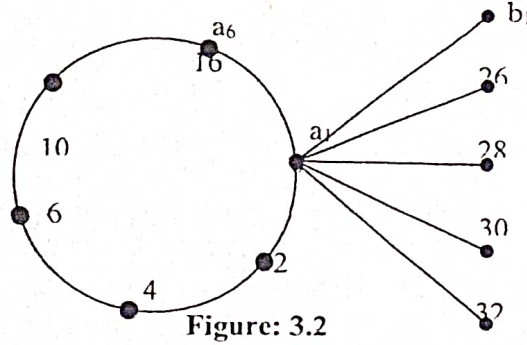


Figure: 3.2

### 3. Conclusion

In this paper, we have explored the concept of even sum graphs and we investigated different types of star related even sum graphs. This paper motivates to derive similar results on other types of graphs to be an even sum graph and to investigate the characterization of even sum graphs.

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