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Metro Domination Number of Cycle with one Chord

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Abstract—
A subset D of the vertex set V of the graph G(V,E) is said to be a Dominating set if every vertex in V-D is adjacent to at least one vertex in D. The minimum cardinality of the dominating set is called the domination number. The metro domination number is the order of a minimum dominating set which resolves as a metric set. It is denoted by $\gamma_\beta(G)$. In this paper, we determine the Metro Domination number of cycle with one chord.

Keywords- Dominating set, Domination number, Metric dimension, Metro domination.

I. INTRODUCTION

Every graphs considered here are simple, finite, undirected and connected. A graph $G = (V, E)$ and $u, v \in V$, $d_G(u, v)$ is denoted as distance between u and v in G. We refer [4,6,7,8,9].

II. Preliminary results

Definition 2.1: A set *D* of vertices in a graph *G(V, E)* is said to be a dominating set of *G*, if every vertex in *V-D* is adjacent to some vertex in *D*. The domination number $\gamma(G)$ of a graph G is the minimum cardinality of the dominating set in *G* [1], [2].

Definition 2.2: A subset $S \subseteq V$ is called resolving set if every pair of $u, v \in V$, there exist a vertex $w \in V$ such that the distance between vertices $u, v \in V$ is represented as $d(u, w) \neq d(v, w)$. A set of vertices $S \subseteq V(G)$ resolves G, then S is a resolving set of G and its minimum cardinality is a metric basis of *G*, and its cardinality is the metric dimension of *G*, and is represented by $\beta(G)$.

Definition 2.3: Metro domination number introduced by B. Sooryanarayana and Raghunath . A dominating set *D* of *V(G)* which is both dominating set as well as resolving set is called the metro dominating set of *G*. The minimum cardinality of a metro dominating set of G is called metro domination number of G, denoted by $\gamma_\beta(G)$.

Remark 2.4: Metric dimension of cycle with one chord is 2.

III. MAIN RESULT

Theorem 3.1 For any integer n, $\gamma_\beta(C_n)$ with one chord is $\left\lceil \frac{n-1}{3} \right\rceil$

Proof: Let G be a cycle graph C_n with one chord having $n-$vertices and $(n+1)$ edges.The minimal dominating set and its cordinality $\left\lceil \frac{n-1}{3} \right\rceil$. By using [5] and remark 2.4, the metro dominating set is also known as dominating set.

Thus $\gamma_\beta(C_n) \geq \left\lceil \frac{n-1}{3} \right\rceil$ (1)

The dominating set D as follows

$$D = \{u_1, u_{3k-1}\} \text{ where } k \geq 2$$

The Dominating set D serves as metric set

Thus $\gamma_\beta(C_n) \leq \left\lceil \frac{n-1}{3} \right\rceil$ (2)

From (1) and (2)

$\gamma_\beta(C_n)$ with one chord is $\left\lceil \frac{n-1}{3} \right\rceil$

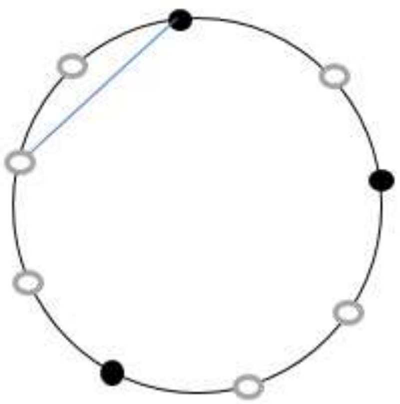

Figure: Metro domination number of cycle with one chord is 3

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