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Metro Domination Number of Triangular Snake Graph

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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 $\gamma(G)$. The metro domination number is the order of a minimum dominating set which resolves as a metric set. It is denoted by $\gamma_{\beta}(TS_n)$. In this paper, we determine metro domination number of Triangular Snake graph.

Keywords— Domination number, Metric dimension, Metro domination number, Locating domination number.

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I. INTRODUCTION

Every graph 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. Definition

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*

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: 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 $\gamma_\beta(G)$.

Definition 2.4: A Triangular Snake Graph (TS_n) is obtained from the path P_n by replacing each edge of the path with a triangular C_3.

That is, a Triangular Snake Graph (TS_n) is obtained from the path $u_1,u_2,u_3,\ldots.u_n$ by joining the u_i and u_{i+1} to new a vertex v_i for $1\le i\le n$. Hence every edge of a path is replace by a triangle.

Corollary 2.5: For any Triangular Snake Graph with n Triangles TS_n, the metro dimension is to for $n\le 2$

Corollary 2.6: For any Triangular Snake Graph TS_n, $\gamma(TS_n)=\left\lceil \frac{n}{2}\right\rceil$

III. Main results

Theorem: For all $n\ge 3$, $\gamma_\beta(TS_n)=\left\lceil \frac{n+2}{2}\right\rceil$

Proof: Let $u_1,u_2,u_3,\ldots.u_n$ be the vertices of TS_n and let v_i be the new vertex obtained by joining u_i and u_{i+1} to form a triangle C_3. By using Corollary 2.5 and Corollary 2.6, a metro dominating set D is also a dominating set.

Thus $\gamma_\beta(TS_n)\le\left\lceil \frac{n+2}{2}\right\rceil$

(1)

We define D as follows

$$D=\{u_{2l-1}\,;\, l\ge 1\}, n\equiv 1(\mathrm{mod}\,2)$$

Choose D in the above case, then D is a dominating set and set $|D|=\left\lceil \frac{n+2}{2}\right\rceil$ and it also serves as a metric set.

Thus $\gamma_\beta(TS_n)\ge\left\lceil \frac{n+2}{2}\right\rceil$ (2)

From (1) and (2)

$$\gamma_\beta(TS_n)=\left\lceil \frac{n+2}{2}\right\rceil$$

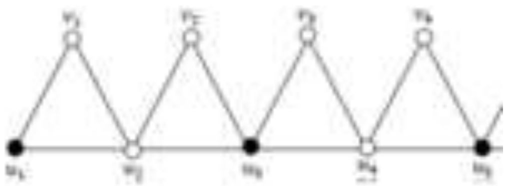

Figure 3.1: $\gamma_\beta(TS_4)=3$

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