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On the Metric Dimension of Join of a Graph with Empty Graph(O_p)

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Abstract

For a graph $G = (V, E)$, a set $W \subset V$ is a resolving set if for each pair of distinct vertices $v_1, v_2 \in V$ there is a vertex $w \in W$ such that $d(v_1, w) \neq d(v_2, w)$. A minimum resolving set or basis for G is a resolving set containing a minimum number of vertices and the cardinality of a minimum resolving set is called the metric dimension of G and is denoted by $dim(G)$. In this paper, we investigates the metric dimension of $K_n + O_p, P_n + O_p$ and $K_{1,n} + O_p$, where O_p denotes the empty (isolated) graph of order p.

Keywords: Join graph, Metric dimension, Resolving sets

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1 Introduction

In [7] and later in [13], Slater introduced the idea of locating set for what we have called resolving set. He referred to the cardinality of a minimum resolving set in a graph G as its location number. Harary and Melter [12] discovered these concepts independently as well but used the term metric dimension rather than location number, the terminology that we have adopted. Resolving sets have applications in chemistry for representing chemical compounds [6], Robotic Navigation [8], problems of network discovery and verification [10], pattern recognition and image processing which involve the use of hierarchical data structures and robot navigation [9]. The metric dimension problem has also been studied for trees and multi-dimensional grids [9] In [5] characterised for a connected graph of $\dim(G) = n - 1$, $\dim(G) = n - 2$. In [2], some bounds for metric dimension of join of graphs G and H as $\dim(G)+\dim(H) \leq \dim(G+H)$ and $\max(\dim(G), \dim H) \leq \min\{\dim(G)+H, \dim(H)+G\} - 1$ are discussed. In this paper we investigate the metric dimensions of join of some families of graphs with O_p.

2 Preliminaries

All the graphs considered in this paper are undirected, simple, finite and connected. The order and size of G are denoted by n and m respectively. We use standard terminology, the terms not defined here may found in [1] and [12]. The following definitions are from [5], [2], [3] and [11].

Definition 2.1 Let $G = (V, E)$ be a connected, undirected graph and $v_1, v_2, v_3 \in V$. A vertex v is said to resolve the vertices v_1 and v_3 if the distance of v_1 from v_2 is different from distance of v_3 from v_2.

Definition 2.2 For an ordered subset $W = \{w_1, w_2, ..., w_k\}$ of $V(G)$ and for any vertex $v \in V$, the (metric)representation of v with respect to W is the k-vector which is denoted and defined as $r(v/W) = (d(v, w_1), d(v, w_2), ..., d(v, w_k))$.

Definition 2.3 The set W is called a resolving set for G if $r(v_1|W) = r(v_2|W)$ implies that $v_1 = v_2$ for all $v_1, v_2 \in V(G)$.

Definition 2.4 A resolving set of minimum cardinality for a graph G is called a minimum resolving set. A minimum resolving set is usually called a basis for G.

Definition 2.5 The minimum cardinality of a resolving set of G is called the metric dimension of G and is denoted by $dim(G)$.

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