Abstract

A basic problem in Chemistry is to provide mathematical representation for a set of chemical compounds in a way that gives distinct representations to distinct compounds. The structure of a chemical compound can be represented by a labeled graph whose vertex and edge labels specify the atom and bond types respectively. Thus a graph theoretic interpretation of this problem is to provide representation for the vertices of a graph in such a way that distinct vertices have distinct representations. Let G be a connected graph and $d(x, y)$ be the distance between the vertices x and y. A subset of vertices $W = \{w_1, \ldots, w_k\}$ is called a resolving set for G if for every two distinct vertices $x, y \in V(G)$ there is a vertex $w_i \in W$ such that $d(x, w_i) \neq d(y, w_i)$. A resolving set containing a minimum number of vertices is called a metric basis for G and the number of vertices in a metric basis is its metric dimension $dim(G)$.
Let G be a connected graph. For a vertex $v \in V(G)$ and an ordered k-partition $\Pi = \{S_1, S_2, ..., S_k\}$ of $V(G)$, the representation of v with respect to Π is the k-vector $r(v|\Pi) = (d(v, S_1), d(v, S_2), ..., d(v, S_k))$. The k-partition Π is said to be resolving if the k-vectors $r(v|\Pi)$, $v \in V(G)$, are distinct. The minimum k for which there is a resolving k-partition of $V(G)$ is called the partition dimension of G, denoted by $pd(G)$. A resolving k-partition $\Pi = \{S_1, S_2, ..., S_k\}$ of $V(G)$ is said to be connected if each subgraph $< S_i >$ induced by S_i $(1 \leq i \leq k)$ is connected in G. The minimum k for which there is a connected resolving k-partition of $V(G)$ is called the connected partition dimension of G, denoted by $cpd(G)$. A resolving k-partition $\Pi = \{S_1, S_2, \ldots, S_k\}$ of $V(G)$ is said to be star if each subgraph $< S_i >$ induced by $S_i (1 \leq i \leq k)$ is a star in G. The minimum k for which there is a star resolving k-partition of $V(G)$ is called the star partition dimension of G, denoted by $spd(G)$.

The aim of this work is to find the metric dimension and partition dimension of some families of graphs. We start by finding the metric dimension of Helm graph H_n and Jahangir graph J_{2n}. Then we find the partition dimension and connected partition dimension of wheels and finally we find the partition dimension and star partition dimension of Jahangir graph.