Abstract

A labeling of a graph is a map that carries graph elements to the numbers (usually positive or non-negative integers). The most common choices of domain are the set of all vertices (vertex labelings), the edge set alone (edge labelings), or the set of all vertices and edges (total labelings).

In many cases, it is interesting to consider the sum of all labels associated with a graph element. It is called the weight of the element: the weight of a vertex or the weight of an edge.

In this thesis, we consider a total k-labeling as a labeling of the vertices and edges of graph G with labels from the set $\{1, 2, \ldots, k\}$. A total k-labeling is defined to be an edge irregular total k-labeling of the graph G if edge-weights are different for all pairs of distinct edges and to be a vertex irregular total k-labeling of G if vertex-weights are different for all pairs of distinct vertices.

The minimum value of k for which the graph G has an edge irregular total k-labeling is called the total edge irregularity strength of the graph G, $tes(G)$. Analogously, the total vertex irregularity strength of G, $tvs(G)$, is defined as the minimum k for which there exists a vertex irregular total k-labeling of G.

In this thesis, we present new results on the total edge irregularity strength and the total vertex irregularity strength.