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# A Study on Vertex Eccentricity Labeled Energy of a Graph

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**ABSTRACT**
In this paper, we introduce the concept of vertex eccentricity labeled energy of a graph. We investigate the vertex eccentricity labeled energy of some standard graphs and graphs obtained from some graph operations. Also, we derive bounds on vertex eccentricity labeled energy.



## 1. INTRODUCTION

In 1966, [1] introduced the idea of labelling. The labelling of a graph $G = (V, E)$ is defined as a function $f$ that maps the set of vertices $V$ to the set of non-negative integers. This function assigns a label to each edge $uv$ in $E$ based on the labels of the vertices $f(u)$ and $f(v)$.

Let $G$ be any simple connected undirected graph with $v_1$, $v_2$, $v_3$, ..., $v_n$ as its vertices, then the adjacency matrix of graph $G$ is a symmetric matrix, denoted by $A(G)$, defined as $A(G) = [a_{ij}]$, such that, $a_{ij} = 1$ if $v_i$ is adjacent to $v_j$, and 0 otherwise. The eigenvalues of adjacency matrix $A(G)$ are known as eigenvalues of the graph $G$ and the sum of all absolute values of eigenvalues of $G$ is called the energy $E(G)$ of the graph $G$. The concept of energy of graph was introduced by [2]. In [3] proved that if the energy of a graph is rational then it must be an even integer, while [4] established that the energy of a graph is never the square root of an odd integer. For latest literature on energy of graph see [5- 10]. For a connected graph $G$, the eccentricity $e$ of a vertex $v$ in G is the maximum distance between $v$ and any other vertex $u$ of G. For a disconnected graph, all vertices are defined to have infinite eccentricity. If the eccentricity of every vertex is same, then $G$ is called Self-centered graph. If the eccentricity of every vertex is equal to $d$, then $G$ is called $d-$ Self-centered graph. The Cartesian product of graphs $G$ and $H$ is the graph $G \square H$ with vertices $V(G \square H) = V(G) \times V(H)$, and for which $(x,u)(y,v)$ is an edge if $x = y$ and $uv \in E(H)$, or $xy \in E(G)$ and $u = v$. The disjoint union of graphs $G$ and $H$ is the graph $G + H$ with vertices $V(G + H) = V(G) \cup V(H)$ and $E(G + H) = E(G) \cup E(H)$. For the undefined terms of graph theory and spectra of graphs we rely on [11-15].