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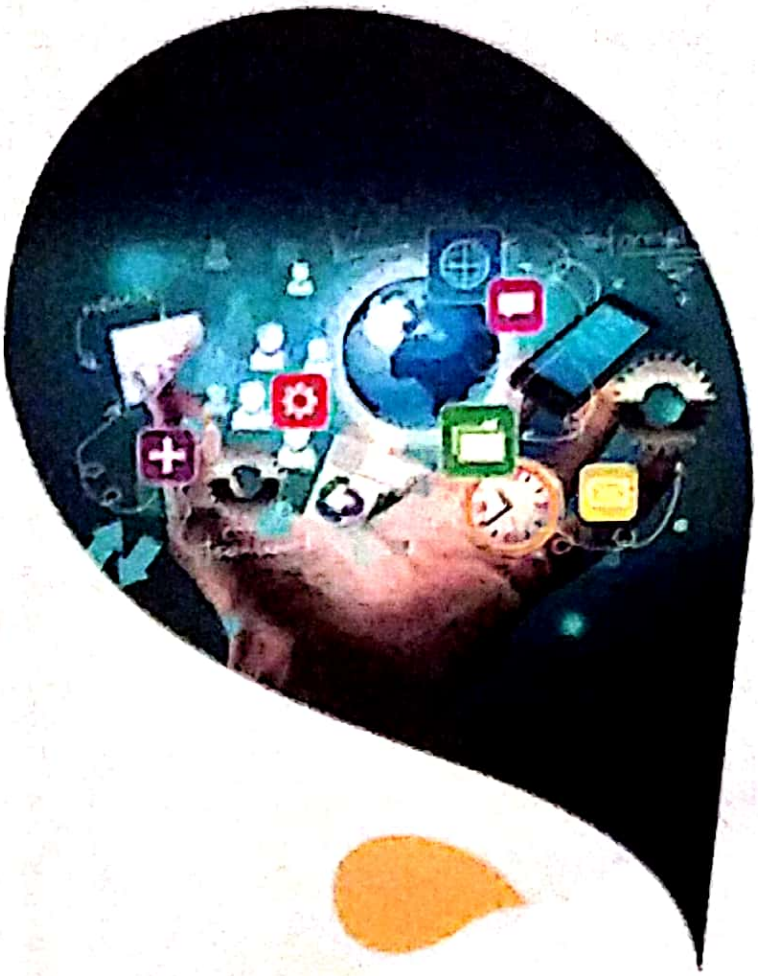

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WEAKLY CONVEX DOMINATING ENERGY OF A GRAPH

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Abstract

The concept of graph energy arose in theoretical chemistry. In theoretical chemistry, the heat formation of a hydrocarbon is related to the total π electron energy and this can be calculated as the energy of corresponding molecular graph. The molecular graph is representation of molecular structure of a hydrocarbon whose vertices are the position of carbon atoms and two vertices are adjacent, if there is a bond connecting them. Eigen values and Eigen vectors provide insight into the geometry of the associated linear transformation. The energy of a graph is the sum of the absolute values of the eigen values of its adjacency matrix. From the pioneering work of Coulson [1] there exists a continuous interest towards the general mathematical properties of the total π electron energy ε as calculated within the framework of the Huckel Molecular Orbital (HMO) model. These efforts enables one to get an insight into the dependence of ε on molecular structure. The properties of ε(G) are discussed in detail in [2-6].

The importance of eigen values is not only used in theoretical chemistry but also in analyze structures. For instance car designers analyze eigen values in order to damp out the noise to reduce the vibration of the car due to music; eigen values can be used to test for cracks or defects in a solid; oil companies frequently use eigen value analysis to explore land for oil; eigen values are also used to discover new and better designs for the future.

Introduction

In this paper we discuss graphs which are undirected simple connected. For a graph G, let $V(G)$ and $E(G)$ denote its vertex set and edge set respectively and n and e denotes its corresponding cardinality. The distance between u and v is denoted by $d(u,v)$ and it is the length of any shortest path between any two vertices u and v of a connected graph. A dominating set D of a graph G= (V, E) is said to be a weakly convex dominating set if for every $u,v \in D$ there exists a u-v shortest path of G entirely contained in <D>. A weakly convex domination number $\gamma_{wc}(G)$ of G is the minimum cardinality of a weakly convex dominating set.

Weakly Convex Dominating Energy

Definition 2.1: Let D be a minimum weakly convex dominating set of a graph G. The minimum weakly convex dominating matrix of G is a square matrix defined by

$$A_{\gamma_{wc}}(G) = a_{ij} \text{ where } a_{ij} = \begin{cases} 1 & \text{if } i = j \text{ and } v_i \in D \\ d(v_i, v_j) & \text{if } v_i, v_j \in D \\ -1 & \text{if } v_i \text{ or } v_j \text{ or both} \notin D \\ 0 & \text{otherwise} \end{cases}$$

The Characteristic polynomial of $A_{\gamma_{wc}}(G)$ is denoted by $f_n(G,\lambda) = \det(\lambda I - A_{\gamma_{wc}}(G))$. That is, $\lambda^n + C_{n-1}\lambda^{n-1} + C_{n-2}\lambda^{n-2} + \ldots + C_1\lambda + C_0 = 0$.

The minimum weakly convex dominating eigen values of the graph G are the eigen values of $A_{\gamma_{wc}}(G)$. Since $A_{\gamma_{wc}}(G)$ is real and symmetric, its eigen values are real numbers