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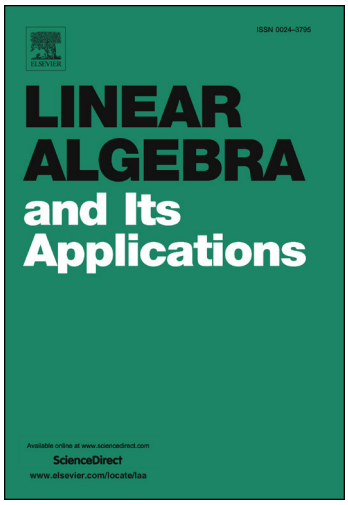

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Kinkar Ch. Das, Seyed Ahmad Mojallal, Ivan Gutman

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Relations between Degrees, Conjugate Degrees and Graph Energies

Kinkar Ch. Das[1], **Seyed Ahmad Mojallal**[1] and **Ivan Gutman**[2,3,*]

[1]*Department of Mathematics, Sungkyunkwan University, Suwon 440-746, Republic of Korea*,
e-mail: kinkardas2003@googlemail.com , ahmad_mojalal@yahoo.com

[2]*Faculty of Science, University of Kragujevac, P. O. Box 60, 34000 Kragujevac, Serbia*,
e-mail: gutman@kg.ac.rs

[3]*State University of Novi Pazar, Novi Pazar, Serbia*

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Abstract

Let G be a simple graph of order n with maximum degree Δ and minimum degree δ. Let $(d) = (d_1, d_2, \ldots, d_n)$ and $(d^*) = (d_1^*, d_2^*, \ldots, d_n^*)$ be the sequences of degrees and conjugate degrees of G. We define $\pi = \sum_{i=1}^{n} \sqrt{d_i}$ and $\pi^* = \sum_{i=1}^{n} \sqrt{d_i^*}$, and prove that $\pi^* \leq LEL \leq IE \leq \pi$ where LEL and IE are, respectively, the Laplacian–energy–like invariant and the incidence energy of G. Moreover, we prove that $\pi - \pi^* > (\sqrt{\delta}/2)(n - \Delta)$ for a certain class of graphs. Finally, we compare the energy of G and π, and present an upper bound for the Laplacian energy in terms of degree sequence.

AMS classification: 05C50, 05C07

Keywords: Degree sequence; Conjugate degree sequence; Energy (of graph); Laplacian energy; Laplacian–energy–like invariant; Incidence energy

1 Introduction

Throughout this paper we are concerned with simple graphs. Let $G = (V, E)$ be such a graph with vertex set $V(G) = \{v_1, v_2, \ldots, v_n\}$ and edge set $E(G)$, where $|V(G)| = n$ and $|E(G)| = m$. Let d_i be the degree of vertex v_i for $i = 1, 2, \ldots, n$ such that $d_1 \geq d_2 \geq \cdots \geq d_n$. The maximum and minimum vertex degrees are denoted by Δ and δ, respectively. The conjugate of a degree sequence $(d) = (d_1, d_2, \ldots, d_n)$ is the sequence $(d^*) = (d_1^*, d_2^*, \ldots, d_n^*)$