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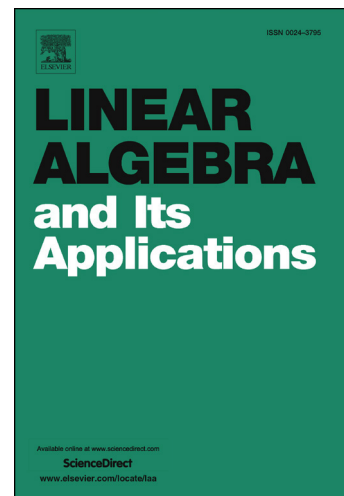
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# Relations between Degrees, Conjugate Degrees and Graph Energies

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## Abstract

Let  $G$  be a simple graph of order  $n$  with maximum degree  $\Delta$  and minimum degree  $\delta$ . Let  $(d) = (d_1, d_2, \dots, d_n)$  and  $(d^*) = (d_1^*, d_2^*, \dots, d_n^*)$  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  $\pi$ , 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  $V(G) = \{v_1, v_2, \dots, v_n\}$  and edge set  $E(G)$ , where  $|V(G)| = n$  and  $|E(G)| = m$ . Let  $d_i$  be the degree of vertex  $v_i$  for  $i = 1, 2, \dots, n$  such that  $d_1 \geq d_2 \geq \dots \geq d_n$ . The maximum and minimum vertex degrees are denoted by  $\Delta$  and  $\delta$ , respectively. The conjugate of a degree sequence  $(d) = (d_1, d_2, \dots, d_n)$  is the sequence  $(d^*) = (d_1^*, d_2^*, \dots, d_n^*)$

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