

# On sum of first $k$ largest Laplacian (signless) eigenvalues of graphs

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**Abstract.** For a simple connected graph  $G$ , let  $L(G)$  and  $Q(G)$  be the Laplacian matrix and the signless Laplacian matrix, respectively. These matrices are real symmetric positive semi-definite (definite) matrices, their eigenvalues can be ordered by natural partial order. In this presentation, we will discuss the spectral properties of these matrices like, sum of the first  $k$  largest (signless) Laplacian eigenvalues (Ky Fan  $k$ -norm), their trace norms (energy). We will discuss the Brouwer's conjecture for  $L(G)$  and Ashraf's conjecture for  $Q(G)$ . We also enlight the Laplacian energy conjecture of trees and discuss some of the constraints on these open problems.

Keywords: Adjacency matrix; (signless) Laplacian matrix; Ky Fan  $k$ -norms, matrix norms, Laplacian energy

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