

Accepted Manuscript

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Vladimir Nikiforov, Oscar Rojo

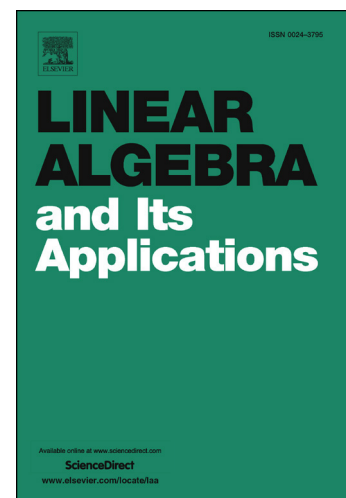
PII: S0024-3795(18)30146-0
DOI: <https://doi.org/10.1016/j.laa.2018.03.036>
Reference: LAA 14528

To appear in: *Linear Algebra and its Applications*

Received date: 12 October 2017
Accepted date: 16 March 2018

Please cite this article in press as: V. Nikiforov, O. Rojo, On the α -index of graphs with pendent paths, *Linear Algebra Appl.* (2018), <https://doi.org/10.1016/j.laa.2018.03.036>

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On the α -index of graphs with pendent paths

Vladimir Nikiforov* and Oscar Rojo†

Abstract

Let G be a graph with adjacency matrix $A(G)$ and let $D(G)$ be the diagonal matrix of the degrees of G . For every real $\alpha \in [0, 1]$, write $A_\alpha(G)$ for the matrix

$$A_\alpha(G) = \alpha D(G) + (1 - \alpha)A(G).$$

This paper presents some extremal results about the spectral radius $\rho_\alpha(G)$ of $A_\alpha(G)$ that generalize previous results about $\rho_0(G)$ and $\rho_{1/2}(G)$.

In particular, write $B_{p,q,r}$ be the graph obtained from a complete graph K_p by deleting an edge and attaching paths P_q and P_r to its ends. It is shown that if $\alpha \in [0, 1)$ and G is a graph of order n and diameter at least k , then

$$\rho_\alpha(G) \leq \rho_\alpha(B_{n-k+2, \lfloor k/2 \rfloor, \lceil k/2 \rceil}),$$

with equality holding if and only if $G = B_{n-k+2, \lfloor k/2 \rfloor, \lceil k/2 \rceil}$. This result generalizes results of Hansen and Stevanović [5], and Liu and Lu [7].

TAMS classification: 05C50, 15A48

Keywords: *convex combination of matrices; signless Laplacian; adjacency matrix; graph diameter; spectral radius.*

1 Introduction

Let G be a graph with adjacency matrix $A(G)$, and let $D(G)$ be the diagonal matrix of its vertex degrees. In [9] the matrix $A_\alpha(G)$ has been defined for any real $\alpha \in [0, 1]$ as

$$A_\alpha(G) = \alpha D(G) + (1 - \alpha)A(G).$$

Write $Q(G)$ for the signless Laplacian $A(G) + D(G)$ of G and note that $A_0(G) = A(G)$ and $2A_{1/2}(G) = Q(G)$; thus, the family $A_\alpha(G)$ extends both $A(G)$ and $Q(G)$.

Write $\rho_\alpha(G)$ for the spectral radius of $A_\alpha(G)$ and call $\rho_\alpha(G)$ the α -index of G . In the spirit of the general problem of Brualdi and Solheid [1], one can ask how large or how small can be the

*Department of Mathematical Sciences, University of Memphis, Memphis TN 38152, USA.

†Department of Mathematics, Universidad Católica del Norte, Antofagasta, Chile.

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