ON REAL OR INTEGRAL SKEW LAPLACIAN SPECTRUM OF DIGRAPHS

S. Pirzada, Hilal A. Ganie and Bilal A. Chat

Abstract. For a simple connected graph G with n vertices and m edges, let $\overrightarrow{G}$ be a digraph obtained by giving an arbitrary direction to the edges of G. In this paper, we consider the skew Laplacian matrix of a digraph $\overrightarrow{G}$ and we obtain the skew Laplacian spectrum of the orientations of a complete bipartite graph, complete split graph and the join of two graphs. We prove that deleting an edge of a Hamiltonian path in a transitive tournament does not effect the skew Laplacian spectrum. We show the existence of various families of skew Laplacian integral digraphs.

REFERENCES

[1] C. ADIGA, R. BALAKRISHNAN AND W. SO, *The skew energy of a digraph*, Linear Algebra Appl. **432** (2010) 1825–1835.

[2] B. A. CHAT, H. A. GANIE AND S. PIRZADA, *Bounds for the skew Laplacian spectral radius of oriented graphs*, Carpathian J. Math. **35 (1)** (2019) 31–40.

[3] D. CVETKOVIC, M. DOOB AND H. SACHS, *Spectra of Graphs-Theory and Application*, Academic Press, New York, 1980.

[4] Q. CAI, X. LI AND J. SONG, *New skew Laplacian energy of simple digraphs*, Trans. Combin. **2, 1** (2013) 27–37.

[5] H. A. GANIE, *Bounds for the skew Laplacian(skew adjacency) spectral radius of a digraph*, Trans. Combin. **8, 2** (2019) 1–12.

[6] HILAL A. GANIE AND S. PIRZADA, *On the bounds for signless Laplacian energy of a graph*, Discrete Appl. Math. **228** (2017) 3–13.

[7] HILAL A. GANIE, A. M. ALGHAMDI AND S. PIRZADA, *On the sum of the Laplacian eigenvalues of a graph and Brouwer's conjecture*, Linear Algebra Appl. **501** (2016) 376–389.

[8] HILAL A. GANIE, BILAL A. CHAT AND S. PIRZADA, *Signless Laplacian energy of a graph and energy of a line graph*, Linear Algebra Appl. **544** (2018) 306–324.

[9] HILAL A. GANIE, BILAL A. CHAT AND S. PIRZADA, *Skew Laplacian spectra and skew Laplacian energy of digraphs*, Kragujevac J. Maths. **43** (1) (2019) 87–98.

[10] H. A. GANIE, S. PIRZADA, B. A. CHAT AND X. LI, *On skew Laplacian spectrum and energy of digraphs*, Asian-European J. Math. doi:10.1142/S1793557121500510.

[11] Y. P. HOU AND A. X. FANG, *Unicyclic graphs with reciprocal skew eigenvalues property*, Acta Math. Sinica (Chinese Series) **57, 4** (2014) 657–664.

[12] XUEYI HUANG AND QIONGXIANG HUANG, *On the Laplacian integral tricyclic graphs*, Linear Multilinear Algebra **63, 7** (2015) 1356–1371.

[13] G. INDULAL, R. BALAKRISHNAN AND A. ANURADHA, *Some new families of integral graphs*, Indian J. Pure Applied Mathematics **45, 6** (2014) 805–817.

[14] X. LI AND H. LIAN, *A survey on the skew energy of oriented graphs*, arXiv:1304.5707v6 [math.CO] 18 May 2015.

[15] S. F. LU AND J. Y. ZOU, *The new class of Laplacian integral graphs*, Advanced Materials Research, **989–994** (2014) 2643–2646.

[16] S. PIRZADA AND HILAL A. GANIE, *On the Laplacian eigenvalues of a graph and Laplacian energy*, Linear Algebra Appl. **486** (2015) 454–468.

[17] S. Pirzada, *An Introduction to Graph Theory*, Universities Press, Orient BlackSwan, India, 2012.

[18] B. Shader and W. So, *Skew spectra of oriented graphs*, Electron. J. Combin. **16** (2009) N32.

[19] Y. Wang and B. Zhou, *A note on skew spectrum of graphs*, Ars Combin. **110** (2013) 481–485.

[20] G. Xu, *Some inequalities on the skew-spectral radii of oriented graphs*, J. Inequal. Appl. (2012) 2012:211.

[21] G. Xu and S. Gong, *On oriented graphs whose skew spectral radii do not exceed 2*, Linear Algebra Appl. **439** (2013) 2878–2887.

[22] L. You, M. Yan, W. So and W. Xi, *On the spectrum of an equitable quotient matrix and its application*, Linear Algebra Appl. 577 (2019) 21–40.

Operators and Matrices
www.ele-math.com
oam@ele-math.com