On the resistance-distance spectral radius and the resistance-distance energy of graphs

A. Dilek Maden

Selçuk University, Konya, Turkey

Abstract

The *RD-eigenvalues* $\{\rho_1, \rho_2, \ldots, \rho_p\}$ of a connected graph G are the eigenvalues of its resistance-distance matrix RD. The greatest RD-eigenvalue is called the *RD-spectral radius* of G and denoted by ρ_1. Additionally, it has been recently defined that ([9]) the *RD-energy* of a graph G, denoted by $RDE(G)$, is the sum of absolute values of its RD-eigenvalues. In this paper, we obtain some lower bounds for ρ_1 and characterise those graphs for which these bounds are the best possible. Moreover we obtain an upper bound for RDE and determine those maximal RD-energy graphs.

Keywords

Resistance-distance spectral radius, Resistance-distance energy.

References

[1] Buckley, F. and F. Harray (1990). *Distance in Graphs*. Addison-Wesley, Redwood.

[2] Chen, H. and F. Zhang (2007). Resistance distance and the normalized Laplacian spectrum. *Discrete Appl. Math. 155*, 654–661.

[3] Cvetkovic, D., P. Rowlinson, and S.K. Simic (2010). *Introduction to the Theory of Graph Spectra*. Cambridge Univ. Press, Cambridge.

[4] Cvetkovic, D., M. Doob, and H. Sachs (1980). *Spectra of Graphs Theory and Application*. Academic Press.

[5] Graovac, A., I. Gutman, and N. Trinajstic (1977). *Topological Approach to the Chemistry of Conjugated Molecules*. Springer-Verlag, Berlin.

[6] Gutman, I. (2001). The energy of a graph: Old and new results. In: A. Betten, A. Kohnert, R. Laue, A. Wassermann (Eds.) *Algebraic Combinatorics and Applications* (196–211). Springer-Verlag, Berlin.

[7] Klein, D.J. and M. Randic (1993). Resistance distance. Applied graph theory and discrete mathematics in chemistry (Saskatoon, SK, 1991). *J. Math. Chem. 12(1-4)*, 81–95.

[8] Klein, D.J. (1997). Graph geometry, graph metrics, & Wiener. Fifty years of the Wiener index. *MATCH Commun. Math. Comput. Chem. 35*, 7–27.

[9] Maden (Güngör), A.D., K.C. Das, and A.S. Çevik. On the Kirchhoff index and the resistance-distance - Energy of a graph. *MATCH Commun. Math. Comput. Chem.* Accepted.

[10] Xiao, W. and I. Gutman (2003). Resistance distance and Laplacian spectrum. *Theor. Chem. Accounts 110*, 284–289.

[11] Xiao, W. and I. Gutman (2003). On resistance matrices. *MATCH Commun. Math. Comput. Chem. 49*, 67–81.

[12] Zhang, F. (1991). *Matrix Theory: Basic Results and Techniques.* Springer-Verlag, Berlin.