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Eccentric connectivity index of graphs with subdivided edges

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Abstract

We consider four classes of graphs arising from a given graph via different types of edge subdivisions. We present explicit formulas expressing their eccentric connectivity index in terms of the eccentric connectivity index of the original graph and some auxiliary invariants.

Keywords: Eccentric connectivity index, subdivided graph.

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1 Introduction

The eccentric connectivity index is a distance-related topological invariant whose potential of predicting biological activity of certain classes of chemical compounds made it very attractive for use in QSAR/QSPR studies. We refer the reader to a number of recent papers [7,11,12,13,15] that demonstrate its suitability for the task. In spite of its increasing importance, mathematical properties of this invariant have been largely left unexplored; only recently they started to attract more attention from the mathematical community [17,10,4,5,3]. An interested reader could consult a very useful summary of recent results by Ilić [9]. Most of the papers cited there were concerned with finding extremal values of the eccentric connectivity index in various classes of graphs, as well as with the study of its behavior under several graph products. The aim of this paper is to continue this line of research by studying the relationship between the eccentric connectivity index of a given graph and of four new graphs that arise via subdivision of its edges.

In the next section we define the types of edge subdivisions considered in the rest of the paper and quote some relevant results on the distances in such graphs. Section 3 presents the explicit formulas for the eccentric connectivity index of subdivided graphs in terms of the eccentric connectivity index of original graph and some auxiliary invariants. Finally, in Section 4 we discuss some possible directions for further research.

2 Definitions and preliminary results

All graphs in this paper are finite, simple and connected. For terms and concepts not defined here we refer the reader to any of several standard monographs such as, e.g., [8].

Let G be a graph on n vertices. We denote the vertex and the edge set of G by $V(G)$ and $E(G)$, respectively. For two vertices u and v of $V(G)$ their **distance** $d(u,v)$ is defined as the length of any shortest path connecting u and v in G. For a given vertex u of $V(G)$ its **eccentricity** $\varepsilon(u)$ is the largest distance between u and any other vertex v of G. Hence, $\varepsilon(u) = \max_{v\in V(G)} d(u,v)$. The

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