Expected value of first Zagreb connection index in random cyclooctatetraene chain, random polyphenyls chain and random chain network

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The Zagreb connection indices are the known topological descriptors of the graphs that are constructed from the connection cardinality (degree of given nodes lying at distance 2) presented in 1972 to determine the total electron energy of the alternant hydrocarbons. Form a long period, all these connection indices do not get attention. Currently, Ali and Trinajstić [Mol. Inform. 37, Art. No. 1800008, 2018] represented the Zagreb connection indices and found that these indices comparatively to basic Zagreb indices give the finer value for the correlation coefficient for the 13 physico-chemical characteristics of the octane isomers. In this article, we acquire the formulae of expected values of first Zagreb connection index of random cyclooctatetraene chain, random polyphenyls chain and random chain network with l number of octagons, hexagons and pentagons, respectively. Moreover, we study the extreme and average values of all the above random chains with respect to the set of special chains: the meta-chain, the ortho-chain and the para-chain.