Some Topological Indices of Cartesian Product of Firecracker with P_2 Path Graph

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One fascinating area of graph theory that has numerous applications in chemistry is called chemical graph theory. A molecular graph is a simple graph in which vertices and edges, respectively, represent atoms and the chemical bonds between them. Computing topological indices is now one of the most active areas of chemical graph theory. The main role of a topological index is to predict various physicochemical properties of a molecule graph. Decks of cards, computer graphics, and other real-world objects can all be represented using Cartesian products. This study focuses on finding topological indices of the Cartesian product of Firecracker with P_2 Path graph. A firecracker graph $(F_{n,k})$ is created by concatenating n copies of k stars from the root of exactly one star where $n \geq 2$ and $k \geq 4$. The Cartesian product of Firecracker with P_2 Path graph (F_p) is constructed by connecting two firecracker graphs $F_{n,k}(n \geq 2, k \geq 4)$ using the P_2 graph. The F_p has order p and size $p + nk - 2$ where $p = 2nk$. E. Deutsch and S. Klavžar introduced M-polynomials to determine the most general polynomials to produce degree-based topological indices. The most important benefit of the M-polynomial is its wealth of information about degree-based graph transformations. The closed form of many degree-based topological indices has been derived for the line graph of the firecracker graph using an M-polynomial. In this study, we derived formulas for the topological indices such as the First Zagreb Index, Second Zagreb Index, Third Zagreb Index, Hyper - Zagreb Index, Randić Index, Atom-Bond Connectivity Index, Geometric-Arithmetic Index, Sum-Connectivity Index, Zagreb Index, and Inverse Sum Index of the Cartesian product of Firecracker with P_2 Path graph using M-Polynomial.

Keywords: Cartesian Product, Firecracker Graph, M-Polynomial, Topological Indices