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FIRST KASHVI-TOSHA GAMMA STRESS INDEX FOR GRAPHS

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Abstract. Shimbel (1953) introduced the concept of node stress. In a graph, stress of a node is the number of geodesics (shortest paths) that pass through it. A number that connects a chemical structure to physical properties or chemical reactivity is known as a topological index of the chemical structure. In this paper, we present the first Kashvi-Tosha gamma stress index $FKT(G)$, a novel topological index for graphs based on vertex stresses. The motivation for this work lies in refining stress-based topological indices to better capture higher-order structural features of graphs. Existing measures such as stress indices and the Kashvi–Tosha stress index $KT(G)$ are limited to linear or quadratic terms, whereas the proposed *First Kashvi–Tosha Gamma Stress Index* ($FKT(G)$) incorporates cubic stress interactions, offering enhanced sensitivity. The novelty of this paper is the introduction of $FKT(G)$, derivation of exact formulas and inequalities for classical graph families, and demonstration of its predictive power in *Quantitative Structure–Property Relationships* (QSPR) of lower alkanes. The strong statistical correlations with physico-chemical properties highlight its significance as both a mathematical advancement and a practical tool in computational chemistry.