

## ON SECOND AND THIRD LEAP ZAGREB COINDICES OF SOME GRAPH OPERATIONS

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**Abstract:** Recently, the authors introduced the leap Zagreb coindices (LZCIs) of graphs. They presented many properties, so also, established upper and lower bounds for them. They, also in last work, studied and presented the general formulas for the first leap Zagreb coindex of some operations of a graph. In the present work, we investigate to continue in our work by computing the general formulas of the second and third LZCIs of union, cartesian product, composition, disjunction, symmetric difference of graphs.

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### 1. Introduction

Throughout this paper, we assume that all graphs  $\Gamma = (V, E)$  are simple. That is finite, have neither loops, nor multiple, nor directed edges. Let  $\Gamma$  be such a graph, the cardinality of the vertex set  $V(\Gamma)$  and edge set  $E(\Gamma)$ , will be denoted by  $n$  and  $m$ , are called the order and size of a graph  $\Gamma$ , respectively. A distance from a vertex  $v$  to a vertex  $u$ , in  $\Gamma$ , denoted by  $d(u, v)$  (or  $d_{\Gamma}(u, v)$  if there is any confusion), and is the number of edges in a shortest path connecting them. the open second neighborhood of a vertex  $v$  in  $\Gamma$  is  $N_2(v) = \{u \in V(\Gamma) : d(u, v) = 2\}$ . The set of all second (2-distance) edges of a graph  $\Gamma$  denoted and defined as