

PROPER LUCKY LABELLING FOR MÖBIUS LADDER GRAPHS

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Proper Lucky labelling is a graph labelling concept in which adjacent vertices are assigned distinct labels, and the sums of the labels of adjacent vertices are also distinct. A graph that satisfies both of these conditions is called a Proper Lucky labelling graph. The smallest natural number needed to label the graph in this manner is known as the Proper Lucky number, denoted by $\eta_p(G)$. The Möbius ladder graph (M_{2n}) is a graph formed by connecting two cycles with edges in a twisted pattern, creating a non-orientable structure. This study focuses on determining the Proper Lucky number of the Möbius ladder graph and deriving a general formula for labelling this class of graphs. In Proper Lucky labelling, vertex labelling should be from the set $\{1,2,3, \dots, k\}$ such that k is the least natural number that labels the graph, and gets general formulas for vertex labelling of each graph. For that, we consider n number of vertices in one cycle, and we get 2 as the Proper Lucky number for the Möbius ladder graph when n is odd, otherwise, it is 4. Further, it is proved that these general formulas are valid for infinite graphs. Future studies can explore the Proper Lucky labelling of generalized Möbius like structures and other non-orientable or topologically complex graphs. Also, algorithmic approaches could be explored to compute Proper Lucky numbers for large-scale or dynamic graphs.

Keywords: Graph labelling, Infinite graph, Möbius ladder graph, Proper lucky labelling, Proper lucky number