

## **ABSTRACT**

### **MODULAR EDGE IRREGULARITY STRENGTH OF JELLYFISH GRAPHS, SHARPENED PENCIL GRAPHS AND LADDER GRAPHS**

by

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*Graph labeling is an active area of research in graph theory, particularly in the study of irregular labeling. The integration of irregular labeling with modular arithmetic has led to the development of the concept of modular edge irregularity strength, denoted by  $\text{mes}(G)$ . Research on  $\text{mes}(G)$  remains relatively limited and has mainly focused on basic classes of graphs. However, studies on  $\text{mes}(G)$  of modified graphs are still limited, making this topic worthy of further investigation. Therefore, this study aims to determine the value of  $\text{mes}(G)$  for several graphs obtained from modifications of cycle graphs, namely the jellyfish graphs  $J_{n,1}$ ,  $J_{n,2}$ , and  $J_{n,3}$ , the single-pointed pencil graph ( $PC_n$ ), the double-pointed pencil graph ( $PC'_n$ ), the ladder graph ( $L_n$ ), and the slanted ladder graph ( $L_n$ ). An analytical approach is employed by constructing vertex labeling functions for each graph to obtain distinct edge weights modulo the number of edges of the graph. The results show the existence of vertex labelings that achieve the  $\text{mes}(G)$  values for the graphs under study. In addition, this research contributes to the development of graph labeling studies, particularly in the area of modular edge irregularity strength.*

**Keywords:** *graph labeling, modular edge irregularity strength, modular  $k$ -edge labeling, modified graphs, jellyfish graph, sharpened pencil graph, ladder graph*