

**PRIME LABELLING OF CENTERLESS DOUBLE WHEEL GRAPH USING PYTHON PROGRAMMING**

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This research investigated the prime labelling of the Centerless Double Wheel graph ( $CDW_{2n}$ ) using Python programming. Prime labelling is a type of graph labelling that assigns labels to graph vertices such that the greatest common divisor of the labels of adjacent vertices is one. While most previous works on prime labelling have largely relied on manual methods to assign values to vertices based on specific conditions, this study automates the labelling process through programming. The Centerless Double Wheel graph is a simple graph obtained by using the Cartesian product of Cyclic graph;  $C_n$  with  $n$  vertices and Complete graph of the form  $K_2$  and is denoted by  $CDW_{2n}$  (i.e.  $C_n \times K_2 = CDW_{2n}$ ). If  $n$  is an even integer, then  $CDW_{2n}$  achieve its prime labelling based on whether  $n + 1$  is prime, or,  $2n + 1$  is prime. Contrarily, this study established that no prime labelling exists for  $CDW_{2n}$  when  $n$  is odd. The proof of the theorem is given as a combinatorial version, and the algorithmic approach was detailed using Python, offering a step-by-step procedure for generating and labelling  $CDW_{2n}$  graphs. This work advances the understanding of prime graph labelling and provides computational tools to simplify the process, setting a foundation for future exploration of more complex graph structures.

**Keywords:** Centerless Double Wheel graph, Prime labelling, Python programming