

**PRODUCT CORDIAL LABELLING OF LATTICE OF HELM GRAPHS**

**C.L.R. Fernando<sup>\*</sup>, A.A.I. Perera and A.T. Senadeera**

*Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*  
*<sup>\*</sup>lakshitharashan1999@gmail.com*

Graph labelling is a widely studied concept in graph theory, involving the assignment of integers to vertices, edges, or both under specific constraints. One such labelling, cordial labelling, was introduced by Ibrahim Cahit in 1987 as a generalization of graceful and harmonious labelling. A particular variant, known as product cordial labelling, is defined for a graph  $G = (V(G), E(G))$  as a function  $f: V(G) \rightarrow \{0,1\}$ , where each edge  $uv$  receives a label determined by the product  $f(u)f(v)$ . The labeling must satisfy two conditions: the absolute difference between the number of vertices labeled 0 and those labeled 1 should be at most 1, and the absolute difference between the number of edges labeled 0 and those labeled 1 should also not exceed 1. If a graph can be labelled in this manner, it is classified as product cordial. The concept of product cordial labelling was introduced by R. Ponraj, M. Sivakumar, and M. Sundaram, and since then, many authors have worked on this product cordial labelling and have identified many types of graphs as product cordial. The helm graph  $H_n$  is the graph obtained from an  $n$ -wheel graph by adjoining a pendant edge at each node of the cycle, which can be used in real world situations like controlling systems, networking, etc. This study presents that helm graphs are product cordial, and introduce the product cordial labelling for any such graph depending on whether its cycles have odd or even number of vertices. Furthermore, the product cordiality of lattices of helm graphs is studied by combining a finite number of copies of helm graphs with or without bridging edges.

**Keywords:** Cordial labelling, Helm graph, Labelling, Product cordial labelling, Wheel graph