

# Abstract

## CERTAIN TOPICS PERTAINING TO GRAPH LABELING

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**Keywords:** Graph Labeling; Abelian Group;  $k$ -cordial Labeling; Fan; Double Fan; Wheel; Bistar; Prism; Helm; Closed Helm; Ladder; Friendship Graph; Flower Graph; Pan Graph; Path Union of a Graph; One Point Union of a Graph; Corona Graph; Vertex Switching of a Graph.

**Background:** The roots of Graph Theory lie in the endeavor to solve Konigsberg Bridge Problem. In the year 1736, the great Swiss Mathematician Leonhard Euler (1707-1783) used graph to study this famous problem. This problem led to the concept of Eulerian Graph. In 1847, G.R. Kirchhoff (1824-1887) developed the theory of trees for their application in electrical networks. A. F. Mobious (1790-1868) presented the famous Four Color problem in 1840 and gave the concept of Complete and Bipartite Graphs. In fact, the last century witnessed the unprecedented growth of Graph Theory.

**Aim and Objectives:** To discuss  $k$ -cordial labeling in detail and derive new innovative results on  $k$ -cordial labeling for different values of  $k$  also to derive some general results for all values of integer  $k$ .

The objectives at the beginning of research were:

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- A surveying of all different types of Graph Labeling Techniques.
  - A study to pursue the effect of graph operations on various Graph Labelings particularly,  $k$ -cordial labeling.
  - The aim is also to offer new findings in the direction of  $k$ -cordial labeling.
  - An attempt to introduce the research work significant for the rigorous applications.

**Methods:** Different approaches and methodology were applied depending upon the challenges and requirements posed in Graph Labeling. The application of essential and conceptual methodology formed very foundation of the structure. Here is an outline of the research work.

- A probe into Various Graph Labeling Techniques;
- Introduction of New Graph Labeling Techniques and Innovative Results;
- Find New Families of Graphs in Cordial Labeling;
- Find New Families of Graphs in  $k$ -equitable Labeling;
- Find New Families of Graphs in  $k$ -cordial Labeling;

In the course of Research work the Researcher has referred reference books and research papers published in reputed National/International journals which related to research area. An in depth study of reputed e-journals to review the research papers in the field of Graph Labeling Techniques have also been conducted to lend a depth and perspective.

**Results and Discussion:** This research work deals with the  $k$ -cordial labeling and the content is presented in six chapters. The First Chapter is of introductory nature while the Second Chapter serves as background for the subsequent chapters. The Third Chapter is focused on 5-cordial labeling of graphs, reporting some of the existing results and contributing fourteen new results. The Fourth Chapter is targeted to discuss 7-cordial labeling of graphs and contributes nine new results to the theory of 7-cordial graphs. The investigation of  $k$ -cordial labeling for some standard graphs has been done in Fifth Chapter. The last Chapter is focused on the discussion on  $k$ -cordial labeling of path and cycle in the context of vertex switching.

**Conclusions:**

In this research work

- i) Fourteen new results have been derived for 5-cordial labeling.
- ii) Nine new results have been found for 7-cordial labeling.
- iii) Fifteen new results have been added in the field of  $k$ -cordial labeling.