Abstract

INNOVATIONS IN CORDIAL AND 3–EQUITABLE LABELING

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Keywords: Cordial Labeling, Divisor Labeling, Fibonacci Cordial Labeling, 3-equitable Labeling, path union of a graph, star of a graph, vertex switching of a graph, barycentric subdivision of a graph, one point union of a graph, ring sum of two graphs.

Background: The subject of graph theory had its beginnings in recreational math problems, but it has grown into a significant area of mathematical research with applications in chemistry, operations research, social sciences and computer science. The history of graph theory may be specifically traced to 1735, when the Swiss mathematician Leonhard Euler solved the Königsberg bridge problem. The concept of graph
labeling was introduced in 1967 by A. Rosa.

**Aim:** To discussed Cordial and 3-equitable labeling in detail and derived new results in Cordial labeling, Divisor cordial labeling, Fibonacci cordial labeling and 3-equitable labeling.

**Materials and Methods:** Graph labeling is a bridge connecting graph theory and combinatorics. Graph labeling find their origin in $\beta$-valuation discussed by A. Rosa in 1967. Graceful and Harmonious labelings were studied by many researchers. The development of different graph labeling techniques is due to the famous conjecture *All Trees are graceful* which remains unsolved after many years. Different labeling patterns are defined with the use of combinatorics and basic idea of number theory.

**Results and Discussion:** This thesis is intended to discuss about cordial labeling and 3-equitable labeling of graphs. The thesis is split into six chapters. In this thesis four different graph labelings namely cordial labeling, divisor cordial labeling, Fibonacci cordial labeling, 3-equitable labeling have been discussed and several new results have been derived. New results on cordial graphs in the context of different graph operations such as path union of a graph, star of a graph, vertex switching of a graph, barycentric subdivision of a graph, one point union of a graph, ringsum of a graph have been derived. New graph families admitting divisor cordial labeling are investigated. Divisor cordial graphs in the context of barycentric subdivision and vertex switching of a graph are found as well. We introduce the concept of Fibonacci cordial labeling and found several graph families satisfying the condition of Fibonacci cordial labeling. Moreover innovative results on 3-equitable labeling of graphs have been derived. Some open problems have been proposed for the better scope of the research in the field of graph labeling.

**Conclusions:** Two important labelings are discussed and innovative results have been derived in this thesis. Study of different graph operations in context of graph
labeling techniques is one of the important aspect in the theory of graphs. I have discussed and derived thirty six results on cordial, divisor cordial and 3-equitable labeling of graphs. New labeling is introduced using connection between cordial labeling and Fibonacci numbers named Fibonacci cordial labeling and derived fourteen results. The results and theory developed/derived here will add new dimensions for upcoming research work in this field.