NEW COLORING OF ZERO DIVISOR GRAPH OF SOME SPECIAL ALGEBRAIC STRUCTURES

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This thesis investigates mainly the coloring problem of the zero-divisor graph of various commutative algebraic structures such as commutative groupoid, commutative semigroup, distributive lattice, commutative semiring and commutative loopring. The thesis mainly concentrates on vertex coloring of the zero-divisor graphs and its vertex chromatic number.

Chapter 1 provides an outline of the coloring problem of commutative algebraic structures. It also provides the basic concepts from graph theory and commutative algebraic structures, relevant to this thesis. A literature survey is given to the work in proper perspective.

Chapter 2 offers the concept of colorings to a commutative groupoid. Some new class of commutative groupoids using Z_n are constructed on which different binary non-associative

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operations are defined and the chromatic number is computed. Given some well-known class of graphs, the existence of the corresponding zero-divisor semigroup is also studied in this chapter.

Chapter 3 deals with the coloring problem of the commutative semiring. Some new class of commutative semirings using Z_2 and Z_n are constructed and their chromatic numbers are computed. Finally, the chromatic number of finite Boolean algebra is computed. In Chapter 4, the zero-divisor graphs of some special class of looprings using Z_2 and Z are studied and their chromatic numbers are determined. In Chapter 5, the concept of generalized k-strongly edgemagic labeling is introduced. Necessary and sufficient condition for a triangle-free graph to be 1-strongly edgemagic is obtained and necessary condition for a disconnected graph to be 1-strongly edgemagic is also discussed. The 1-(strongly)-edgemagicness of an r-regular graph is completely determined. Finally, some well-known classes of graphs are proved to be 2-strongly edgemagic, which are 1-strongly edgemagic.

Parts of this thesis have been published as the following papers.

1. *The chromatic number of a commutative groupoid*, Ultra Sci. Phys. Sci., 16 (2004) 111-118.

2. *The chromatic number of some new classes of commutative semirings using Z_n*, Ultra Sci. Phys. Sci. 16 (2004) 301-306.

3. *On the chromatic number x(KL) of the commutative loop rings using new class of loops $L_n(m)$*, Trends in Theory of Rings and Modules, (eds: S.Tariq Rizvi and S.M.A. Zaidi), Anamaya Publishers, New Delhi (2005), 161-170.

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4. *Chromatic number of semirings*, Proceedings of the KMA National Seminar on Graph Theory and Fuzzy Mathematics (Eds: T.Thrivikraman, A.Sunny Kuriakose, and A.Mathew), Kerala Mathematical Association, Pathanamthitta, (2003), 129-136.

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