

**The chromatic number of prime graph of a non-commutative ring
 $M_{n \times n} \times (\mathbb{Z}_2)$**

K. A. D. D. B. V. Kolombage* and G. S. Wijesiri

*Department of Mathematics, Faculty of Science,
University of Kelaniya, Sri Lanka
bkolombage@yahoo.com*

Graph theory is a significant area of Mathematics as its outstanding applications in many fields such as biochemistry, electrical engineering, computer science and operational research. Besides Graph theory, Ring theory is an abstract area in Mathematics. A ring consists of a set equipped with two binary operations that generalize the arithmetic operations of addition (+) and multiplication (*). Theorems obtained as a result of abstract study of rings can be applied to solve problems arising in number theory, geometry and many other fields.

The study of rings with the help of graphs began when a graph of a commutative ring was defined by I. Beck in 1988. Then a new bridge was formed between graph theory and the algebraic concept “ring” noted as prime graph of a ring R , denoted by $PG(R)$ by B. Satyanarayana, K. Shyam Prasad, and D.Nagaraju in 2010. Later on with the help of existing concepts, K. Patra and S. Kalita investigated the chromatic number of prime graph, $\chi PG(\mathbb{Z}_n)$ of ring \mathbb{Z}_n for different values of n .

Prime graph of a ring R is a graph whose vertices are all elements of the ring and any two vertices x, y of the vertex set are adjacent if and only if $x * y = 0$ or $y * x = 0$ and $x \neq y$

In this paper, we investigate the chromatic number of prime graph of some non-commutative rings $M_{n \times n}(\mathbb{Z}_2)$ for different values of n . The chromatic number of prime graph of some commutative rings are formed on the recognition of the conjecture that chromatic number, $\chi(R)$ and clique number are the same. But for non-commutative rings this is not always the case. Hence, in order to find the chromatic number of prime graph of a non-commutative ring, $M_{n \times n}(\mathbb{Z}_2)$, we have looked into MATLAB for a tactical solution.

Keywords: Chromatic number, Non commutative rings, Prime graph, Zero divisor