MASENO UNIVERSITY

SCHOOL OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

THE ZERO DIVISOR GRAPHS OF CLASSES OF COMPLETELY PRIMARY FINITE RINGS OF MAXIMAL PRIME POWER CHARACTERISTIC

Abstract

It is well known that in a finite ring R, every element is either a zero divisor or a unit. The classification of finite rings is not fully settled. Different studies have generated interesting results on certain classes of finite rings. It is worthwhile to note that completely primary finite rings have proved to be useful towards the classification of finite rings. This is due to the fact that a finite ring has a unique maximal ideal if and only if it is a full matrix ring over a completely primary finite ring. Moreover, any commutative ring is a direct sum of completely primary finite rings. A deeper understanding of the elements in a finite ring enables us to fully understand the ring. In this study, we investigated and characterized the zero divisor graphs of classes of commutative completely primary finite rings of maximal prime power characteristics. For each class of rings, zero divisor graphs are drawn and trends in their geometric properties established through graph theoretic approach. In higher order cases, properties of zero divisors of commutative rings are employed in interpreting and determining the invariant geometrical structures of the graphs. This study has established that the diameter of the zero divisor graphs of the rings studied lie between 0 and 2 while their girth is either 3 or infinity. None of the rings has a zero divisor graph that is n-gon, where n is an integer greater than 3. Fundamentally, this study has revealed that rings whose zero divisor graphs are isomorphic are not necessarily isomorphic. The findings of this study extend further the knowledge about the structure theory of finite rings and in particular, the classification of the zero divisors of commutative completely primary finite rings.

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