

On the finiteness of a commutative ring with a finite k -zero divisor hyper-graph and the classification of finite commutative rings with $HG(R) = 2$

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In a commutative ring R , an element a_1 is called a k -zero divisor, if there exist elements a_2, a_3, \dots, a_k such that (1) all a_i are pairwise distinct (2) the product $\prod a_i = 0$, and (3) the product $\prod_{i \neq j} a_i \neq 0$ for all j . In 2007, Ch. Eslahchi and A. M. Rahimi introduced k -uniform hyper-graphs over commutative rings. Vertex set, denoted by $Z(R, k)$, consists of all the k -zero divisors and edges are k -sets which satisfy properties (1), (2), and (3) listed above. R is a k integral domain if it does not contain any k -zero divisors. In the same paper, they posed the following question: Does the finiteness of k -zero-divisors in a non k -integral domain R imply the finiteness of zero divisors or, equivalently, finiteness of R ? In this paper, we provide an affirmative answer to this question. Further, we classify all the finite rings having hyper-graphic constant equal to 2 and present a list of such rings up to isomorphism.