Available online at http://scik.org
J. Math. Comput. Sci. 10 (2020), No. 5, 1643-1666
https://doi.org/10.28919/jmcs/4719
ISSN: 1927-5307

SPECTRUM OF THE ZERO-DIVISOR GRAPH ON THE RING OF INTEGERS MODULO n

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Abstract. For a commutative ring R with non-zero identity, let $Z^*(R)$ denote the set of non-zero zero-divisors of R. The zero-divisor graph of R, denoted by $\Gamma(R)$, is a simple undirected graph with all non-zero zero-divisors as vertices and two distinct vertices $x,y \in Z^*(R)$ are adjacent if and only if $xy = 0$. In this paper, the adjacency matrix and spectrum of $\Gamma(\mathbb{Z}_{p^k})$ are investigated. Also, the implicit computation of the spectrum of $\Gamma(\mathbb{Z}_n)$ is described.

Keywords: eigenvalues; zero-divisor graph; block matrix; adjacency matrix.

2010 AMS Subject Classification: 05C50.

1. INTRODUCTION

let G be a simple graph with vertex set $V(G) = \{v_1, v_2, \ldots, v_n\}$. The adjacency matrix of G is the $n \times n$ matrix $A(G) = (a_{uv})$, where a_{uv} is the number of edges joining vertices u and v, each loop counting as two edges. For a simple graph, $A(G)$ is real and symmetric with entries 0 and 1, where all diagonal entries are zeroes. That is , for a simple graph G, $A(G) = (a_{ij})$, where a_{ij}=1 or 0 according as $v_i \sim v_j$ in G or not.

The eigenvalues of a square matrix B are the roots of its characteristic polynomial $det(B - xI)$.

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Received May 21, 2020