



A Peer-Reviewed International Multidisciplinary Research
ISSN : 2584-1963 (Approved)

Spectral and Structural Characteristics of Graph Topologies: A Comparative Matrix-Based Analysis

Mrs. Auti Jyoti Bhaskar

Assistant Professor,
ASM's College of Commerce, Science and
Information Technology, Pimpri, Pune-18
Email: jyotiauti@asmedu.org

Abstract:

In discrete mathematics, the translation of pictorial graph structures into computational formats is essential for algorithmic processing. This paper explores the multidimensional utility of matrix representations—specifically adjacency, incidence, and Laplacian matrices—in deciphering graph structural properties. By leveraging spectral graph theory, we examine how eigenvalue distributions provide diagnostic insights into network connectivity and robustness. The study proposes a unified framework for matrix

selection tailored to computational efficiency and analytical depth.

Keywords: Spectral Graph Theory, Laplacian Matrix, Graph Connectivity, Linear Algebra, Adjacency Matrix.