ABSTRACT

The adjacency energy of a graph is defined as the sum of the absolute values of all eigenvalues of its adjacency matrix. In addition to the adjacency matrix, the energy of a graph can also be derived from the distance matrix, known as distance energy. This study determines the general form of the adjacency energy and distance energy of the rook's graph B_{nn} *for* $n \geq 2$*. The steps involve constructing the characteristic equation, determining the spectrum, and calculating the energy. The results show that the general form of the adjacency energy of the rook's graph is* $\mathcal{E}(B_{nn}) = 4n^2 - 8n + 4$*, while the distance energy is* $\mathcal{E}_D(B_{nn}) = 4n^2 - 4n$*. Furthermore, the distance energy is always greater than the adjacency energy, indicating that the overall contribution of distances between vertices in the rook's graph is greater than that of direct connections between vertices.*

Keywords*: rook's graph, adjacency matrix, distance matrix, graph spectrum, adjacency energy, distance energy.*