

On Reliability Models Associated with the Edge Domination Number for Unicycles

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Consider a graph where e edges can fail but nodes do not. However, when an edge fails, its endnodes are subverted, i.e., removed from the graph. Given a threshold value $k \geq 1$, the surviving subgraph produced by the failure of edges and the subversion of the endnodes of those edges is said to be in a failure state if all of its components have order $\leq k - 1$. The minimum number of edge failures to yield a failure state is called the neighbor component order edge connectivity and is denoted $\lambda_{nc}^{(k)}$. It is the case that $\lambda_{nc}^{(1)}$ is the size of a minimum edge cover of the nodes and $\lambda_{nc}^{(2)}$ is the edge domination number.

If the edges fail independently, all with the same probability $0 < \rho < 1$, the unreliability of the graph is the probability that the surviving subgraph is in a failure state. If n , e , and k are fixed, a graph on n nodes with e edges is uniformly most reliable (UMR) provided its unreliability is minimum among all graphs in its class for all values of ρ . Uniformly least reliable (ULR) graphs are defined analogously. We present UMR and ULR results for unicycles when $k = 2$. (Results for trees will be presented in On Reliability Models Associated with the Edge Domination Number for Trees.)