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 \( \rho \). Uniformly least reliable (ULR) graphs are defined analogously. We present UMR and ULR results for trees when \( k = 2 \). (Results for unicycles will be presented in On Reliability Models Associated with the Edge Domination Number for Unicycles.)