Abstract

Numerous networks as, for example, road networks, electrical networks and communication networks can be modeled by a graph. Many attempts have been made to determine how well such a network is "connected" or stated differently how much effort is required to break down communication in the system between at least some nodes.

Two well-known measures that indicate how "reliable" a graph is are the "Tenacity" and "Edge-tenacity" of a graph. The tenacity of a graph $G$, $T(G)$, is defined by

$$T(G) = \min \left\{ |A| + \frac{\tau(G - A)}{\omega(G - A)} \right\},$$

where the minimum is taken over all vertex cutset $A$ of $G$. We define $G - A$ to be the graph induced by the vertices of $V - A$, $\tau(G - A)$ is the number of vertices in the largest component of the graph by $G - A$ and $\omega(G - A)$ is the number of components of $G - A$. A connected graph $G$ is called T-tenacious if $|A| + \tau(G - A) \geq T \omega(G - A)$ holds for any subset $A$ of vertices of $G$ with $\omega(G - a) > 1$.

The edge-tenacity $T_e(G)$ of a graph $G$ was defined as

$$T_e(G) = \min_{F \subseteq E(G)} \left\{ \frac{|F| + \tau(G - F)}{\omega(G - F)} \right\},$$

where the minimum is taken over all edge cutset $F$ of $G$. We define $G - F$ to be the graph induced by the edges of $E(G) - F$, $\tau(G - F)$ is the number of edges in the largest component of the graph induced by $G - F$ and $\omega(G - F)$ is the number of components of $G - F$. A set $F \subseteq E(G)$ is said to be a $T_e$-set of $G$ if

$$T_e(G) = \frac{|F| + \tau(G - F)}{\omega(G - F)}$$

Each component has at least one edge.

In this Paper we show several results and bounds on the tenacity and edge-tenacity of a graph, discuss some of the shortcoming of these measures.

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