MINIMAL K-CRITICAL BIPARTITE GRAPHS

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Consider a network of m sensing nodes and n relay nodes. Sensing nodes need to transmit their readings through the relay nodes, using a pre-established infrastructure of links. For each relay node, only one direct connection with a sensing node can be active at any time. Relay nodes are faulty, but at any given time at most $n - m$ of them may be unavailable, leaving at least m relay nodes ready for transmission.

We want to establish a topology of links between sensing and relay nodes, a bipartite graph, to guarantee that under any fault scenario (with at least m relay nodes active), the m sensing nodes can transmit their data through distinct relay nodes.