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• 英文摘要	Reliability is an important indicator in planning, designing and operating any network system. However, many real-world systems such as electric power transmission and distribution systems, transportation systems, manufacturing systems, and etc. which play important roles in our daily lives can be regarded as probabilistic flow networks whose arcs have discrete and multi-valued random capacities. Such a flow network is indeed a multistate system with multistate components and so its source-to-terminal reliability for a system demand level d, i.e. the probability that the maximal flow from a specified source node s to a specified terminal node t is no less than the demand d, can be computed in terms of minimal path vectors to level d [6] (named d-MPs here) or minimal cut vectors to level d [6] (named d-MCs here). Hence, the problem on how to search for all of its d-MPs or d-MCs efficiently arises. In this project, we will mainly concentrate on such flow networks and then study on how: i) to present a simple algorithm to generate all d-MPs and d-MCs respectively for such a flow network from s to t first so that the source-to-terminal reliability for each system demand level d can then be computed in terms of them, ii) to extend the results in (i) to the multiple terminals case so that the source-to-K-terminal reliability of such a flow network can be obtained, and (iii) to present two indices of component importance to the system so as to provide the decision maker with sufficient information to improve the system. After all d-MPs or d-MCs having been obtained, three methods such as inclusion-exclusion method, disjoint subset method and state space decomposition method are then applied to evaluate/approximate the source-to-terminal reliability for each system demand level d in terms of such d-MPs or d-MCs. Several examples are considered to illustrate each of such three methods. In addition, these results are extended so that two simple and efficient algorithms are developed to evaluate the reliability		

of such a flow network from s to k specific terminals. Several examples are considered to illustrate such a proposed method. Finally, two indices of component importance are also presented so as to provide the decision maker with sufficient information to maintain or improve the system.