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A Mathematical Model for Reliability Redundancy Optimization Problem of K-Out-Of-N: G System

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Abstract : According to a remarkable development of science and technology, function and role of the system of engineering fields has recently been diversified. The system has become increasingly more complex and precise, and thus, system designers intended to maximize reliability concentrate more effort at the design stage. This study deals with the reliability redundancy optimization problem (RROP) for k-out-of-n: G system configuration with cold standby and warm standby components. This paper further intends to present the optimal mathematical model through which the following three elements of (i) multiple components choices, (ii) redundant components quantity and (iii) the choice of redundancy strategies may be combined in order to maximize the reliability of the system. Therefore, we focus on the following three issues. First, we consider RROP that there exists warm standby state as well as cold standby state of the component. Second, as eliminating an approximation approach of the previous RROP studies, we construct a precise model for system reliability. Third, given transition time when the state of components changes, we present not simply a workable solution but the advanced method. For the wide applicability of RROPs, moreover, we use absorbing continuous time Markov chain and matrix analytic methods in the suggested mathematical model.

Keywords : RROP, matrix analytic methods, k-out-of-n: G system, MTTF, absorbing continuous time Markov Chain
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