14th Annual International Conference on Industrial Engineering and Operations Management Dubai United Arab Emirates (UAE), February 12-14, 2024

Publisher: IEOM Society International, USA DOI: 10.46254/AN14.20240181
Published: February 12, 2024

A Study of a 2-Unit Cold Standby Repairable System Operating in a Multi-Level Environment

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Abstract

In this article, we consider a 2-unit cold standby system subject to failure and repair in a multi-level environment. At time t = 0, both units are operable and one unit is put into a channel and the other unit is kept as cold standby. The channel does the assignment job and takes a random time to make an assignment to the operable unit to operate in online with a positive probability. The failure time of the online unit has exponential distribution depending on the level of the multi-level environment. We assume that the environment is in any one of the N levels. When the environment is in level k, the assignment probability is q_k such that $\sum_{k=1}^{N} q_k = 1$ and the failure time of the operating unit has exponential distribution with mean $\frac{1}{\lambda_k}, k = 1,2,\cdots,N$. There is a single repair facility which is independent of the environment. Upon failure of the online unit, the standby unit is switched online and the failed unit is immediately taken for repair. The repair commences instantaneously and the repair time has an exponential distribution with mean $\frac{1}{\gamma}$. The switch over time is instantaneous and the switch is perfect. There is a possibility that both units may be together in the repair facility at some point of time and the repair is done on first-come-first-served basis. After each repair, the unit is as new as it was before. Immediately after completion of the repair of a failed unit, it is sent to the cold standby position and the whole process repeats again. For the model, we perform the reliability and availability analysis. We also study the estimation analysis of the availability in the steady state.