

A LIMIT THEOREM OF CERTAIN REPAIRABLE SYSTEMS

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Abstract. Many large engineering systems can be viewed (or imbedded) as a series system in time. In this paper, we introduce the structure of a repairable system and the reliabilities of these large systems are studied systematically by studying the ergodicities of certain non-homogeneous Markov chains. It shows that if the failure probabilities of components satisfy certain conditions, then the reliability of the large system is approximately $\exp(-\beta)$ for some $\beta > 0$. In particular, we demonstrate how the repairable system can be used for studying the reliability of a large linearly connected system. Several practical examples of large consecutive- k -out-of- $n:F$ systems are given to illustrate our results. The Weibull distribution is derived under our natural set-up.

Key words and phrases: Reliability, Markov chain, transition probabilities, linear system, repair-system, consecutive- k -out-of- $n:F$ system.