Reliability of multi-state repairable systems

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The paper deals with the instantaneous and asymptotic availability and also the instantaneous and asymptotic unavailability of repairable multi-state systems [1]. Availability is understood as the ability of the system to be in a state capable of performing the required functions under given conditions, at a given time, provided that all required external resources are provided. Dynamic systems can be in different states at different times. These system states encompass properties such as functional, non-functional, partially functional, or partially non-functional, etc.

In the text of the contribution we will limit ourselves to the so-called homogeneous (or stationary) Markov processes, which are a suitable tool for analyzing the reliability of repairable technical systems [2]. We assume that both the operation and renewal intervals follow an exponential probability distribution.

The aim of the paper is to determine the asymptotic availability (and unavailability) of the system on a model example. Kolmogorov differential equations were used to determine them [3]. The availability of the system with increasing time is a decreasing function of time and the unavailability is an increasing function of time, but unlike the unrepaired system, their values stabilize at constant non-zero values. The paper presents possible ways to determine the steady availability and unavailability of the system on a model example.

This work has been supported by the Scientific Grant Agency of the Slovak Republic KEGA under the grants No. 035STU-4/2024.

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