

Mathematical modelling of dynamic characteristics of repair process for system operating under maintenance contracts

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Abstract

Repair rate is very important parameter in a system maintainability and it can be defined as frequency of the successfully performed repair actions on failed component per unit of time. This paper analyses the integral characteristics of a stochastic repair rate for corresponding values of availability in the system operating under maintenance contracts. The equation for the envelope line of the probability density function (PDF) maximums of the repair rate has been provided. This new expression can be used for planning of base stock levels and capacities of repair facilities. Namely, in that way instead of repair rate PDF equation, for some calculations we can use envelope line parameters, which are expressed in simpler mathematical form, to reduce the time required for calculations and prediction and enhance reactions in failure events. For analytical and numerical evaluation of system performance, the annual repair rate PDFs are analyzed like particular solutions of corresponding differential equation, while the existence of singular solution is considered and analyzed under different conditions. Moreover, we have derived optimal values of availability for which the PDF maximums have been obtained. Finally, in order to generalize behavior of the repair process, a partial differential equation, as a function of the repair rate process and availability parameter, has been formed.

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