STATIC SYSTEM RELIABILITY MODELS

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Introductions. System reliability analysis using static models is a certain form of preliminary analysis. It is used to evaluate the possible composition of equipment at the design stage and to determine the required levels of reliability of subsystems and elements.

Aim. The functional block diagram of the system allows you to determine the impact of the failure of one or another subsystem on the operating characteristics.

Materials and methods. Series connection of elements is the most common model and the easiest to analyze. In order for a system with a serial connection to function, all subsystems must work without fail.

Often, the structure of the object requires the application of this rule to calculate the probability of failure-free operation. At the same time, the reliability of the system decreases rapidly with an increase in the number of serially connected elements. The reliability of the system does not always exceed the reliability of the least reliable element. If it is necessary to ensure a given probability of failure-free operation of the system, then a quick calculation of the required probability of failure-free operation of subsystems is performed according to the corresponding ratio.

A system with parallel connection of elements does not fail until all its elements have failed.

Simple combinations of subsystems with parallel and serial connections of elements can be easily analyzed by sequentially combining subsystems into groups of parallel or serially connected equivalent elements.

The configuration of some products or the nature of complex failures can lead to the creation of systems for which the parallel or series connection of elements is

unsuitable for description.

Several ways of describing such a case can be suggested.

The method described below is not the easiest for some specific tasks, but it is always possible to apply it and it allows you to consider the impact of various types of failures on the operation of the system. The method consists in the fact that all mutually exclusive ways of occurrence of failures in the system are considered. From the possible failure options, dangerous combinations are combined, the probability of which is the product of the corresponding options. The probability of system failure is determined by the sum of the probabilities of dangerous combinations. An obvious disadvantage of the method is that the number of failure modes increases rapidly with an increase in the number of elements. The cumbersome calculations that are inevitable for this method can be simplified by using machine methods.

Results and discussion. System reliability analysis using static models is a certain form of preliminary analysis. It is used to evaluate the possible composition of equipment at the design stage and to determine the required levels of reliability of subsystems and elements.

Conclusions. The functional block diagram of the system allows you to determine the impact of the failure of one or another subsystem on the operating characteristics.

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