Comparison of reliability functions of simple mixed four-element systems

Eva Labašová and Jarmila Oravcová

MTF STU Trnava, Jána Bottu 25, Trnava, SK

The reliability of the systems depends on the reliability of all the subsystems that create them. In the reliability theory, the term simple systems represents systems that can be decomposed into a sequence of serially and / or parallel subsystems [1].

One of the most important reliability indicators is the hazard rate $\lambda(t)$. We need to know the probability density function $f\ (t)$ and the reliability function $R\ (t)$ to determine the hazard rate of the system. The reliability function expresses the probability of survival of time t and is an additional function to the cumulative distribution function $F\ (t)$ [2].

In the classic reliability theory, systems are classified according to the hazard rate function, which is an increasing, constant or decreasing function of time (operating time, number of rode kilometers, number of monitored events, etc.). The bathtub curve of hazard also represents the dependence of hazard rate function on time. Constant hazard rate is a typical feature of systems with exponential distribution of probability time to failure. A constant value of hazard rate function is also an expected feature of well-designed systems in the period of normal usage, if its value is sufficiently low.

The structure of a simple system is usually serial, parallel and serial-parallel. The paper focuses on the calculation and comparison of reliability indicators such as: reliability function, mean time to failure and hazard rate function. Reliability indicators for a combination of systems with four subsystems are compared. The calculations were realized by using the program MATLAB.

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