Residual lifetimes of consecutive k-out-of-n systems

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Abstract

Consecutive type systems have attracted a lot of attention in the field of reliability. A linear consecutive k-out-of-n:F (G) system consists of n linearly ordered components such that the system fails (functions) if and only if at least k consecutive components fail (function). These system models appear in various real life systems including telecommunication and oil pipeline systems, vacuum systems in accelerators, etc.

For some systems of order n, the system may still function with probability 1 when less than $r(< n)$ components fail at time t. Let T denote the lifetime of a system whose components' lifetimes are $T_1, T_2, ..., T_n$. If $T_{r:n}$ denotes the rth smallest lifetime, then the conditional random variable $\{T - t \mid T_{r:n} > t\}$ represents the general residual lifetime of the system under the condition that at least $n - r + 1$ components of the system are working at time t. In this talk, we present some results on usual and general residual lifetimes of consecutive k-out-of-n systems. Mean residual lifetimes of these systems are studied and a signature based analysis is also presented.

Keywords. Consecutive k-out-of-n systems; Order statistics; Residual lifetime; System signature

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