

Block

4**RELIABILITY THEORY**

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BLOCK 4 RELIABILITY

In Block 3, you have learnt how statistical tools help in decision making in different situations. In the same block you have also learnt how to solve games between two opponents.

This block discusses another important issue related to each component/product/device/unit/system: that of reliability. By reliability of a component or system, we mean how long it performs its function (intended function, in technical terms) successfully which it is expected to perform under stated conditions. Our discussion is mostly limited to identical components. This block is divided into four units.

In **Unit 13** entitled **Introduction to Reliability** we define reliability and explain some basic functions of reliability. We also discuss how to estimate the basic functions from test generated complete data.

Unit 14 entitled **Reliability Evaluation of Simple Systems** discusses the concepts of series, parallel and mixed configurations. We also explain how to evaluate reliabilities of the systems having components in either of these configurations.

In **Unit 15** entitled **Reliability Evaluation of k-out-of-n and Standby Systems** we explain how to evaluate the reliability of two other commonly used configurations known as k-out-of-n and standby systems. However, reliability of standby systems is discussed only under certain assumptions.

Unit 16 entitled **Reliability Evaluation of Complex Systems** discusses three general techniques to evaluate the reliability of complex systems. These techniques can also be used to evaluate the reliability of simple systems discussed in Unit 14.

Studying this block requires the knowledge of the first 8 units of the course MST-001 and Units 1 to 3, 5, 8, 9, 15 and 16 of MST-003. So you should keep these courses at hand and should refresh the concepts discussed therein.

Notations and Symbols

Sec.	:	Section
Secs.	:	Sections
Fig.	:	Figure
$N_s(t)$:	Number of components that are operating at time t
$N_f(t)$:	Number of components that have failed at time t
$R(t)$:	Value of reliability function at time t
$F(t)$:	Value of cumulative failure distribution function at time t
$f(t)$:	Failure density function
$\lambda(t)$:	Hazard rate function
MTTF	:	Mean time to failure