



**ST. JOSEPH'S UNIVERSITY, BENGALURU -27**  
**M.Sc STATISTICS – III SEMESTER**  
**SEMESTER EXAMINATION: OCTOBER 2023**  
(Examination conducted in November/December 2023)  
**ST 9623: Reliability Theory**  
**(For current batch students only)**

Registration Number:

Date & session:

**Time: 2 Hours**

**Max Marks: 50**

**This paper contains ONE printed page and ONE part**

**I Answer any FIVE of the following**

**10 X 5 = 50**

1. a) Explain the meaning and need for reliability.  
b) Write structure function for reliability of systems.  
c) Define: i) coherent system. ii) minimal cut set. iii) minimal path set. (2+2+6)
2. a) Define the reliability function and the hazard rate. Bring out the relationship between them.  
b) Distinguish between positive and negative ageing. (6+4)
3. a) Examine whether the life distribution given by the pdf  
 $f(t) = \lambda^2 t e^{-\lambda t}$ ,  $t \geq 0$ ,  $\lambda > 0$  is IFR or DFR. Obtain its Reliability.  
b) Prove that, IFR  $\Rightarrow$  IFRA  $\Rightarrow$  NBU  $\Rightarrow$  NBUE. (4+6)
4. a) Explain three types of system reliability along with structure function and block diagrams.  
b) Define mean time to failure. (8+2)
5. a) Obtain the bounds on reliability function.  
b) If k out of n system is composed of independent like components having IFR components having IFR then the system itself has IFR. (6+4)
6. a) What are shock models? Describe any two shock models.  
b) Explain two different replacement policies. (6+4)
7. a) Describe stress-strength model with any two examples.  
b) Derive reliability when stress and strength variables follow exponential distribution. (5+5)

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