 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

 **M.Sc.** DEGREE EXAMINATION - **STATISTICS**

SECOND SEMESTER – **APRIL 2012**

# ST 2957 - RELIABILITY THEORY

 Date : 24-04-2012 Dept. No. Max. : 100 Marks

 Time : 9:00 - 12:00

**SECTION – A**

**Answer all the questions (10x2=20)**

1. Define Reliability R(t) of a system
2. Define Hazard function r(t)

A

B

C

 3.

RA=0.87, RB=0.85, RC=0.89. Determine system reliability

4. Define Parallel-Series system

5. Define MTBF

6. Define a (k,n) system

7. Define Standby system

8. R(t) = e- 0.2t determine the warranty period for a reliability of 0.9

9. An equipment has a hazard function r(t) = 6x10-8t2. The equipment is required to operate a 100

 hours. What is the reliability at 100 hours?

10. Define a) DFRD b)IFRD

**SECTION-B**

**Answer any five questions (5X8=40)**

11. Obtain the system reliability function R(t) and hazard function r(t) when the system failure time distribution follows Weibull distribution

12. Establish the following (3+3+2)

i)  ii) If R\*(s) = LT{R(t)} then MTBF = R\*(0) iii)If T~Exponential distribution then MTBF=1/λ

 13. Obtain system failure time density function for a (k,n) system

14. Define Series-Parallel system. Obtain system hazard function r(t) and MTBF for a

 Series-Parallel System

15. Consider a series system consisting of two components with first component following a

 exponential failure time distribution with λ=1/10,000 and second component following a

 weibull with parameters β=6 and η=10,000. i)Obtain system reliability ii)Obtain system’s cdf

 and pdf iii) Given that the system has performed 500 hrs what is the reliability of the system

 for an additional 1000hr mission iv)Obtain the system failure rate v)What should be the

 warranty period for a system reliability of 90%

16. Explain the methods of obtaining the reliability of a Complex system

17 Establish the following

1. F is IFR ⬄ on [0,∞)
2. F is IFR ⬄ 

18. i) Establish: r(t) is a conditional probability function but not a conditional pdf

ii) Establish: r(t)↓t ⬄ F is DFRD

**SECTION-C**

**Answer any two questions (2X20=40)**

19. Obtain the reliability function R(t) and hazard function r(t) for the following failure time

 distributions i) Exponential ii) Gamma

20. Obtain MTBF for the case when failure time(T) of a system is distributed as i) Exponential

 ii)Weibull iii) Gamma

21. Consider a Standby system of order 3 with Ti ~ Exponential(λi), i=1,2,3 . obtain the system

 failure time density function and hence obtain the reliability function R(t) for the case when

 λ1= λ2= λ3 and λ1≠ λ2≠ λ3(20)

22. Obtain system mean time between failure (MTBF) for a (k,n) system

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