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**B.E/B.Tech. (FT) DEGREE END SEMESTER EXAMINATION APRIL /MAY 2011**

**INDUSTRIAL ENGINEERING BRANCH**

**VI SEMESTER**

**IE9353 –Reliability Engineering**

**(REGULATION 2008)**

**Time: 3 hr**

**Max Marks: 100**

**Answer All Questions**

**PART 'A' (10 x 2 = 20 Marks)**

1. Give difference between Reliability and Quality.
2. Given the pdf  $f(t) = 0.2 - 0.02t$ ,  $0 \leq t \leq 10$  year. Find MTTF.
3. What is the difference between data that are censored on the left and censored on the right?
4. What are the methods used to estimate the empirical reliability of ungrouped censored data?
5. What is the difference between redundant system and standby system?
6. Compare the hazard rate function of hardware and software.
7. Enumerate all the reliability based design analysis methods?
8. How an optimal replacement period of equipment is calculated?
9. A life test plan is desired which will accept equipment having a specified acceptable mean life of 2000h with a probability of 90%. Eight units are placed on the test a sixth failure occurs when 900h test time is reached. The life test is terminated upon occurrence of 6<sup>th</sup> failure. Determine whether the lot is acceptable or not. [ $K = 0.525$ ].
10. What is meant by Risk triplet?

**PART 'B' (5 x 16 = 80 Marks)**

11. (i) The reliability of a turbine blade can be represented by  $R(t) = (1 - t/t_0)^2$ ,  $0 \leq t \leq t_0$  where  $t_0$  is the maximum life of the blade. (a) Compute the MTTF as a function of maximum life. (b) If the maximum life is 2000 operating hours, what is the design life for a reliability of 0.90 (8)
- (ii) Explain the three periods in the hazard rate function of product life cycle and its significance (8)

12. (a). (i). Explain the steps involved in weibull hazard plotting (8)  
(ii). The time to failure data obtained from 16 experiments are 19, 12, 16, 1, 15, 5, 10, 1, 46, 7, 33, 25, 4, 9, 1 and 10, form the frequency table, draw the histogram, find the mean and standard deviation. (8)

(Or)

- (b). (i). Explain in detail the classification of failure data (8)  
(ii). Demonstrate the steps involved in Chi Square goodness of fit test (8)

13. (a). (i). Explain all the basic elements used in the fault tree analysis (8)  
(ii). For a practical system of your own construct a fault tree (8)

(Or)

- (b). Find out the reliability of the given system

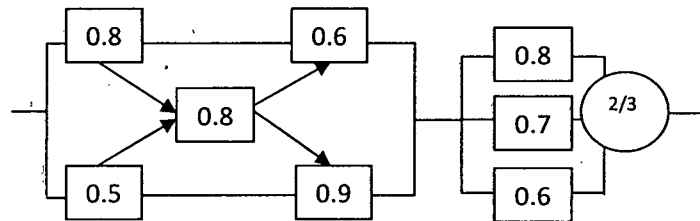


Figure 1

14. (a). Explain in detail Reliability Life Testing methods.

(Or)

- (b). An electronic equipment contains 1000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Rs. 8. If all the resistors are replaced at the same time the cost per resistor is Rs.2. The percentage surviving  $S(i)$  at end of month  $i$  is given below. What is the optimum replacement plan?

Month	0	1	2	3	4	5	6
$S(i)$	100	96	89	68	37	13	0

15. (a). Explain briefly the steps involved in Failure mode Effects Analysis

(Or)

- (b). Explain the steps involved in probabilistic risk assesment