GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – III • EXAMINATION – SUMMER • 2013

Subject code: 732901   **Date: 13-05-2013**
Subject Name: Reliability and Maintainability Engineering
Time: 10.30 am – 01.00 pm   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define and explain following terms,   **07**
      (1) Reliability
      (2) MTBF
      (3) Up time and down time.
   (b) Discuss bath-tub curve of system with reference to hazard rate.   **07**

Q.2 **(a)** Discuss tie set method for reliability evaluation with illustration.   **07**
   (b) Write a brief note on accelerated testing for reliability of the system.   **07**
<div align="center">OR</div>

   (b) Assume that 50% of all engineering students are good in mathematics. **07**
Determine the probabilities that among 18 engineering students (1) exactly 10
(2) at least 10 (3) at most 8 (4) at least 2 and at most 9, are good in
mathematics.

Q.3 **(a)** Explain exponential failure law in reliability engineering.   **07**
   (b) If x is discrete random variable with pdf f(x) given by,   **07**
$f(x) = kq^x$,   where x=0, 1, 2, 3,í í í . and q=0.02
Find the value of constant k. also obtain mean expected value E(x).
<div align="center">OR</div>

Q.3 **(a)** Obtain the reliability expression of following system,   **07**
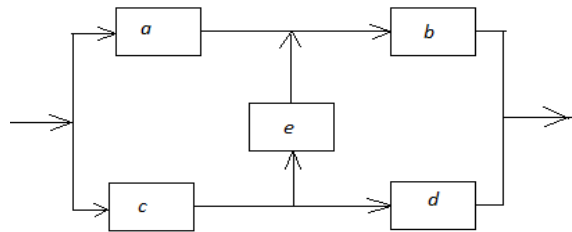
Each component of system is having reliability of R.
   (b) If x is uniformly distributed in $-2 \le x \le 2$. Find (1) $P(X) \le 1$ (2) $P(X) \ge 1$ and **07**
(3) $P(|X - 1| \ge \frac{1}{2})$.

Q.4 **(a)** Discuss event state space method for reliability evaluation with illustration.   **07**
   (b) Explain low level and high level redundancy for improving reliability of the   **07**
system.
<div align="center">OR</div>

Q.4 **(a)** Explain part stress method for electronics system reliability.   **07**
   (b) Write a brief note on binomial distribution. Obtain mean and variance for   **07**
binomial distribution.

Q.5 **(a)** Write a brief note on load sharing system.   **07**
   (b) Discuss the system reliability model with components in series.   **07**

OR

Q.5 **(a)** Obtain relation between reliability and hazard rate. **07**

(b) The failure law of the system is given as $f(t) = \lambda^2 t e^{-\lambda t}$. Find the followings, **07**
(1) Reliability R (t)　　(2) hazard rate h (t)　(3) MTTF.

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