Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – WINTER 2012

Subject code: 732901 **Date: 30/12/2012**

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.**
4. **Notations used have usual meaning.**

Q.1 **(a)** Discuss following terms. **07**

(1) Reliability
(2) MTTF
(3) Availability

(b) If the ticket is drawn from a box containing 10 tickets numbered 1 to 10 inclusive. Find the probability that the number X drawn is, **07**

(1) Less than 4.
(2) Even number.
(3) Prime number.
(4) Mean and variance of the random variable X.

Q.2 **(a)** Explain Hypo-exponential failure law. **07**

(b) A random variable X has the following discrete probability distribution function: **07**

$X=x_i$	0	1	2	3	4	5	6	7
$P(X=x_i)$	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Find,

(i) The value of k
(ii) Evaluate $P(X<6)$
(iii) $P(X\geq 6)$.

OR

(b) Explain Reliability prediction and allocation. **07**

Q.3 **(a)** Write brief note on accelerated testing for reliability of system. **07**

(b) Explain sneak circuit analysis for electronic system reliability. **07**

OR

Q.3 **(a)** Find mean and variance of Binomial Distribution. **07**

(b) Explain cut-set method for reliability evaluation with illustrative example. **07**

Q.4 **(a)** Discuss the effect of perfect preventive maintenance on reliability of a component. **07**

(b) The failure law of a component is given as, **07**

$$f(t) = \lambda^2 t e^{-\lambda t}$$

Obtain,

(1) Reliability function.
(2) Hazard rate.
(3) MTTF.

OR

Q.4	**(a)**	Explain decomposition method for evaluation of the reliability of system with illustration.	**07**
	(b)	Find the mean and variance of uniformly distribution. Also determine its cumulative distribution function.	**07**
Q.5	**(a)**	Discuss star delta method for reliability evaluation with illustration.	**07**
	(b)	A random variable X is uniformly distributed in range (-1, 1). Find, (1) pdf f(x). (2) cdf F(x) (3) Expected mean value E(x). Also Obtain probability density function of random variable $y = 5x^2$.	**07**

OR

Q.5	**(a)**	Obtain derivation of reliability function using MARKOV model.	**07**
	(b)	Explain part stress method for electronic system reliability.	**07**

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