

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, **07**
(1) pdf $f(x)$.
(2) cdf $F(x)$
(3) Expected mean value $E(x)$. Also Obtain probability density function of random variable $y = 5x^2$.
- OR**
- Q.5** (a) Obtain derivation of reliability function using MARKOV model. **07**
(b) Explain part stress method for electronic system reliability. **07**
