Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– III • EXAMINATION – SUMMER 2015

Subject Code: 732901 **Date: 30/04/2015**

Subject Name: Reliability and Maintainability Engineering

Time: 2:30 pm to 5:00 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)** Discuss bath-tub curve of system with reference to hazard rate. **07**

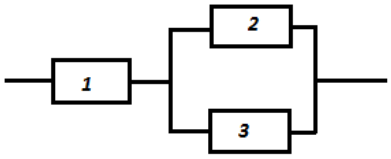
(b) Write a brief note on reliability prediction and allocation. **07**

Q.2 **(a)** Define the following terms and Discuss its significance. **07**

(1) Reliability

(2) MTTF

(b) Three components are connected as shown in figure below. Each component is having reliability of $R(t) = e^{-\lambda t}$. Determine the overall reliability of the system. Also find MTTF of the system. **07**



OR

(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	k	k	0	$2k$	0	$7k^2 + k$

Find,

(1) The value of k

(2) $P(X < 4)$

(3) $P(X \geq 2)$

Q.3 **(a)** Write a brief note on accelerated testing with respect to reliability engineering. **07**

(b) Discuss about the reliability of system comprises the component in parallel. **07**

OR

Q.3 **(a)** Explain redundancy techniques in system design. Also discuss how system reliability can be increased with redundancy? **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).

If another random variable y is defined as $y = x^2$, obtain probability density function of random variable y.

Q.4 **(a)** Explain delta-star method for reliability evaluation with suitable example. **07**

	(b)	A missile launcher can hold 6 missiles. The probability that an individual missile is non-failed at missile launch is 90%. What is the probability (R) that at least 4 are non-failed when an operational demand occurs?	**07**
		OR	
Q.4	**(a)**	Write a brief note on Poissonôs distribution. Discuss its significance	**07**
	(b)	Two capacitors are connected in series. Find the reliability of series connected capacitors.	**07**
Q.5	**(a)**	Explain part count method for evaluation of reliability of electronics system.	**07**
	(b)	Write a short note on Markov chain in reliability engineering.	**07**
		OR	
Q.5	**(a)**	Discuss event state space method for reliability evaluation with illustration.	**07**
	(b)	Explain Tie-set method for reliability evaluation with illustrative example.	**07**

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