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**B. E. (Seventh Semester) Examination,
Nov.-Dec., 2018**

(New Scheme)

(AEI, EI Engg. Branch)

INSTRUMENTATION SYSTEM RELIABILITY

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all question. Part (a) is compulsory in each question. Attempt any two out of (b), (c) and (d) in each question.

Unit-I

- 1. (a) Write the importance of reliability in system instrumentation. 2

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- (b) Draw & explain Bath tub curve. 7

- (b) Consider the following reliability function, where t is in hours :

$$R(t) = \frac{1}{0.001t + 1} \quad t \geq 0$$

- (i) Find the reliability after 100 operating hours.
- (ii) Derive the Hazard Rate function. Is it an increasing or a decreasing failure rate? 7

- (d) Prove that : <http://www.csvtuonline.com>

$$\sigma^2 = \int_0^{\infty} t^2 f(t) dt - (MTTF)^2$$

Unit-II

- 2. (a) What is mean failure rate? 2

- (b) Prove that $MTTF = \theta \left[1 + \frac{1}{B} \right]$. 7

- (c) An aircraft engine consist of three modules having constant failure rates of $\lambda_1 = 0.002$, $\lambda_2 = 0.015$ and

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$\lambda_3 = 0.0025$ failure per operating hours. Find the reliability function for engine and MTTF?

(d) Explain log normal distribution in detail. 7

Unit-III

3. (a) What is tie set method? 2

(b) Explain fault tree technique in detail. 7

(c) A radio set consist of three major components : Power supply, receiver, amplifier, having reliabilities of 0.8, 0.9 and 0.85 respectively. Compute system reliabilities for both high level and low level redundancy for system with two parallel components. 7

(d) Derrive and explain markov method for reliability function. 7

Unit-IV

4. (a) Discuss Redundency with application. 2

(b) Explain Reliability Design process. 7

(c) Draw & explain reliability growth testing. 7

(d) Compare component & unit redundancy & try to find which one is better for reliability improvement. 7

Unit-V

5. (a) What is mean repair time? 2

(b) Explain Availability with its types. 7

(c) A component can be repaired at constant rate of 10 per 8 hr day. What is the probability of a single repair exceeding 1 hr. 7

(d) Given two component each having a constant failure rate of 0.10 failure per hour and a constant repair rate of 0.20 repair per hour, compute point and interval availability for a 10 hr. mission and steady -state availability for series configuration. 7

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