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Roll No .....

ME-7004(2)-CBGS

B.E. VII Semester

Examination, June 2020

Choice Based Grading System (CBGS)

Reliability Engineering

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.
iii) Appendix A is permitted (Normal Distribution).

1. a) Define: 7
   i) Failure rate
   ii) Hazard rate. Explain their application to the reliability of components and repairable system.
   b) Discuss bath tub curve. 7

2. a) Explain the difference between MTTF and MTBF. 7
   b) The reliability of a missile is 0.85. If a salvo of two missiles is fixed, what is the probability of at least one hit.
   (Assume S-independence of missile hits). 7

3. a) Explain the relationship between the exponential and Poisson distribution in a reliability context. 7
   b) Explain various laws of random events. 7

4. Show that function

$$f_T(t) = \frac{1}{2}t^2 \text{ for } 0 < t \leq 1$$

$$= \frac{1}{2}\left[t^2 - 3(t-1)^2\right] \text{ for } 1 \leq t < 2$$

$$= \frac{1}{2}\left[t^2 - 3(t-1)^2 + 3\,(t-2)^2 \text{ for } 2 \leq t \leq 3\right.$$

$$= 0 \text{ else where}$$

can be a failure density function. Obtain expression for probability of failure with in time t, reliability for time t, and the hazard function $z(t)$ sketch this function. 14

5. a) Explain the measures of central tendency. 7
   b) What is an exponential hazard model? Explain. 7

6. a) The mean time to failure of a particular type of component is 800h. What is the probability that a similar component will fail in an operating time of (i) 200 hrs (ii) 400 hrs (iii) 800 hrs (iv) 100 hrs. 7
   b) A parallel system is composed of ten identical independent components? If the system reliability p(s) is to be 0.95, how poor can be components be. 7

7. a) Give the formulae for safety margin, where the load applied to an item and the strength of the item are assumed to be s-normally distributed. 7
   b) Explain Monto Carlo simulation. 7

8. a) What are the objectives of reliability testing? Explain different types of reliability test. 7
   b) Explain Fault Tree Analysis (FTA). 7

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