SLOT E

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, APR 2021/SEPT 2021

Branch: Mechanical Engineering

Stream(s): Industrial Engineering

Course Code & Name: 01ME6415 Reliability Engineering

Answer *any two full* questions from *each* part

Limit answers to the required points.

Max. Marks: 60 Duration: 3 hours

PART A

1. a. Distinguish between MTTF and MTBF with the help of examples. (4.5)

   b. A household appliance is advertised as having more than 10 year life. The probability density function is given by $f(t) = 0.1(1+0.05t)^{-3}$ $t \geq 0$. What is its MTTF before the warranty period, and what is its MTTF after the warranty period assuming it has still survived? (4.5)

2. a. With the help of an industrial example, explain about bath tub curve and its importance. (4.5)

   b. Derive an expression for memorylessness and describe about its practical significance. (4.5)

3. a. Derive an expression for instantaneous hazard rate function. Also derive an expression for reliability function in terms of hazard rate function. (4.5)

   b. Describe about Failure on demand with the help of a practical example. (4.5)

PART B

4. a. Derive an expression for reliability function of a redundant CFR model. Also obtain an expression for finding out the MTTF for the above mentioned model. (4.5)

   b. Explain about weakest link method with the help of an example. (4.5)

5. a. Derive an expression for finding out the reliability of a bidirectional bridge network. (4.5)

b. With the help of an example, explain about application of reliability bounds. (4.5)

6. a. Derive an expression for the difference between low level redundancy and high level redundancy. (4.5)

b. With the help of an example illustrate the application of minimal cutset and tie set methods. (4.5)

PART C

7. a. Explain in detail about Reliability allocation methods. (6)

b. With the help of expressions, explain about various types of availability. (6)

8. a. Explain in detail about following terms. (6)

a) Inherent availability.
b) Achieved availability.
c) Operational availability.

b. With the help of an example, illustrate how reliability of a system is calculated using fault tree analysis. (6)

9. a. Explain in detail about Markov analysis. (6)

b. What is the importance of Maintainability in Reliability analysis? Explain. (6)