Code No: 138GU **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, July - 2021
RELIABILITY ENGINEERING
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks
- - -

1.a) Two dice are rolled, find the probability that the sum is
i) equal to 1 ii) equal to 4 iii) less than 13
b) If P(A) = 7/13, P(B) = 9/13 and P(A∩B) = 4/13, evaluate P(A|B). [8+7]

2.a) Derive the expression for Expected value and standard deviation of Binomial distribution.
b) Draw and discuss various regions of Bathtub curve. [8+7]

3. For the system shown in figure 1, the system success requires that at least one of the paths is good. Evaluate a general expression for system success and also evaluate the reliability of the system using cut set based approach if each component has a reliability of 0.9. [15]

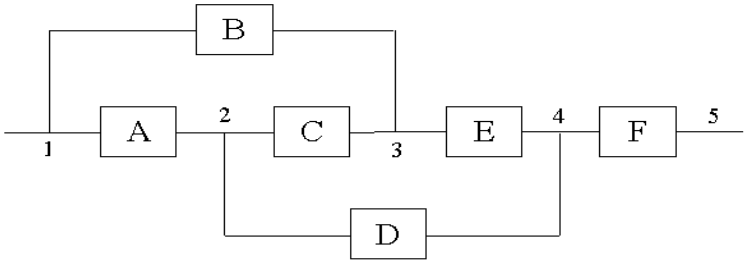

Figure 1

4. A simple electronic circuit consists of 6 transistors each having a failure rate of 10^{-6} f/hr, 4 diodes each having a failure rate of 0.5×10^{-6} f/hr, 3 capacitors each having a failure rate of 0.2×10^{-6} f/hr, 10 resistors each having a failure rate of 5×10^{-6} f/hr and 2 switches each having a failure rate of 2×10^{-6} f/hr. Assuming connectors and wiring are 100% reliable evaluate the equipment failure rate of the system and the probability of the system surviving 1000 hrs, 5000hrs and also 10000 hrs if all components must operate for system success. [15]

5. A component has a reliability function given by $R(t) = 1-\frac{t^2}{a^2}$ $for\, 0 \le t \le a$ where a is a parameter of the distribution representing the component's maximum life. Find f(t), h(t) and MTTF. [15]

6.a) Explain the two state Markov process of a single component with repair.

b) Derive the expression for limiting state probabilities of a two component repairable model with identical capacities and identical transitional rates. [7+8]

7. Consider the three-state system shown in figure 2 and the transitional probabilities among the states indicated. Evaluate the limiting state probabilities associated with each state. [15]

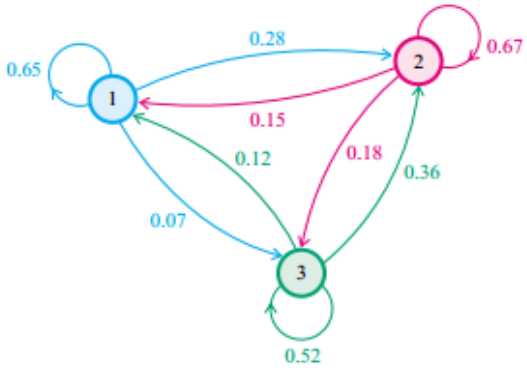

Figure 2

8. Discuss the frequency and duration concepts applicable to multistate problems. [15]

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