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(2063)

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M.Tech 2nd Semester Examination

Reliability of Electronics and Communication Systems

EC-205

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary continuation sheet will be issued.

Note : Attempt any five questions.

1. (a) Explain Maintainability function and hence find the expression for mean time to Repair. **(10)**

   (b) Describe hazard rate and MTBF. How it is related to overall reliability of system. **(10)**

2. (a) Define Availability and find expression of availability in term of μ and λ. Where, μ = repair rate and λ = failure rate. **(10)**

   (b) Three generators, one with a capacity of 100kW and other two with a capacity of 50kW each are connected in parallel. Draw the reliability logic diagram if the required load is;

   (i) 100 kW (ii) 150 kW

   Determine the reliability of both the arrangement if the reliability of each generator is 0.95. **(10)**

3. (a) Explain Cut set and Tie set method for calculation of reliability of Non-Serial-Parallel system. **(10)**

(b) Two transmitters are installed at a particular station with each capable of meeting the full requirement. One transmitter has a mean constant failure rate of 9 faults per 10^4 hours and occurrence of each fault renders it out of service for a fixed time of 50 hrs. The other transmitter has a corresponding failure rate of 15 faults per 10^4 hours and an out of service time per fault rate of 20 hours. What is the mean availability of the system? **(10)**

4. (a) Derive an expression for reliability and MTBF for K out of M systems. **(10)**

(b) An electronic circuit consists of 5 silicon transistors, 10 silicon diodes, 20 composition resistors, and 5 ceramic capacitors in continues series operation and assume that under the actual stress conditions in the circuit the components have the following failure rates:

Silicon transistors	$\lambda t = 0.000008$/hour
Silicon diodes	$\lambda d = 0.000002$/ hour
Composition resistors	$\lambda r = 0.000001$/ hour
Ceramic capacitors	$\lambda c = 0.000004$/ hour

Estimate the reliability of this circuit for 10 hours operation. **(10)**

5. (a) Calculate the system reliability and MTFF for two unit parallel system with repair. **(10)**

   (b) An electric bulb has a failure rate of 0.0002/hour when glowing and that of 0.00002/hour when not glowing. At that instant of switching –ON, the failure rate is estimated to be 0.0005/switching. What is the average failure rate of the bulb in on the average it is switched 6 times every day and it remains ON for a total of 8 hours in the day on the average. **(10)**

6. (a) Find expression for the reliability and MTBF of stand-by system. **(10)**

   (b) Equipment is to be designed to have minimum reliability of 0.8 and a minimum availability of 0.98 over a period of 2×10^3 Hours. Determine the mean repair rate and frequency of failure of the equipment. **(10)**

7. (a) Derive and expression for reliability and MTBF for series system. **(10)**

   (b) Describe the measures of maintainability and availability. **(10)**

8. Write a short note on any two of following

   (a) Equipment availability. **(10)**

   (b) Mission availability. **(10)**