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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(ECE) (EL-I 2016 Batch) (Sem.-2)

RELIABILITY OF ELECTRONICS COMMUNICATION SYSTEMS

Subject Code : MTEC-204 C

Paper ID : [74283]

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

Q1. a) Describe hazard rate and MTBF. How it related to overall reliability of the system?

b) Define failure rate. Discuss how the failure rate is calculated.

Q2. a) Explain terms “Minimum Pathways” and “Minimum Cut Sets” with an example?

b) A transceiver has four components : a receiver, a power supply, a transmitter, and an antenna system. Reliability specifications require the transceiver to operate 1000 hr with a probability of 0.99. Determine the components reliability. The component data is as follows :

Components	Importance index, w_i	Operating time, hr	Number of modules, n_i
Receiver	0.8	1000	25
Antenna	1.0	1000	15
Transmitter	0.7	500	23
Power supply	1.0	1000	70

Q3. a) The failure distribution is defined by :

$$f(t) = \frac{3t^2}{10^9}$$

- i. What is the probability of failure within a 100-hr warranty period?
- ii. Compute the MTTF.
- iii. Find the design life for a reliability of 0.99.

- b) What is the maximum number of identical and independent Weibull components having a scale parameter of 10,000 operating hours and a shape parameter of 1.3 that can be put in series if a reliability of 0.95 at 100 operating hours is desired? What is the resulting system MTTF?
- Q4. a) A signal processor has a reliability of 0.90. Because of the low reliability a redundant signal processor is to be added. However, a signal splitter must be added before the signal processors, and a comparator must be added after the signal processors. Each of these new components has a reliability of 0.95. Does adding a redundant signal processor increase the system reliability?
- b) Find the system reliability of the following series-parallel configurations. Component reliabilities are given.

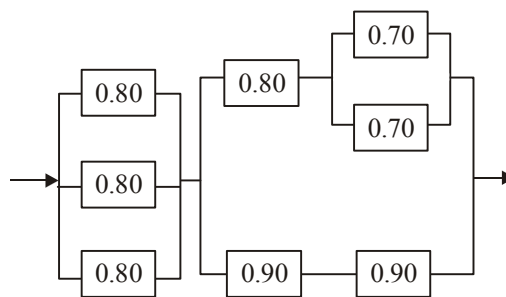


Fig.1

- Q5. a) What is the difference between “Achievable Availability” and “Operational Availability”?
- b) A requirement exists for an engine fuel pump to be repaired (or replaced) within 3 hours 90% of time. If the repair distribution is lognormal with $s = 0.45$, what MTTR should be achieved to meet this goal?
- Q6. a) Define availability, intrinsic availability equipment availability and generalized operational availability.
- b) An emergency backup generator experiences standby (dormant) failures at a constant rate of 0.00314 per day. It takes 6 hr to inspect and test the generator. If it is found to be inoperative, it takes 24 hr to repair it. Determine an inspection interval that will maximize the availability of the generator.
- Q7. Write short notes on the following :
- a) Reliability and Safety.
- b) Reliability Management.
- Q8. Explain the term reliability, maintainability, availability, quality and failure. What are the various measures of reliability? Define conditionally reliability.