

- (b) Explain in detail the reliability allocation factors. **15**

Unit III

5. (a) 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 a faults per 10^4 hrs and occurrence if 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 of 20 Hrs. What is the mean availability of the system ? **15**
- (b) Consider a system consisting of 10 tubes. The failure rate for each tube is $\lambda = 0.01/\text{hr}$. How many spaces are necessary to satisfy a 99.73% confidence level, that there will be no stock out for a mission time of 1000 hr.

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B. Tech. EXAMINATION, Dec. 2017

(Eighth Semester)

(B. Scheme) (Re-appear Only)

(ECE)

ECE-418-B

RELIABILITY ENGINEERING

Time : 3 Hours]

[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Explain Catastrophic failures and degradation failures in detail. **15**

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

Silicon transistors $\lambda_t = 0.000008/\text{hr}$

Silicon transistors $\lambda_d = 0.000002/\text{hr}$

Composition transistors $\lambda_r = 0.000001/\text{hr}$

Ceramic capacitors $\lambda_c = 0.000004/\text{hr}$

Estimate the reliability of this circuit for 10 hour operation.

- (b) Three generators, one with a capacity of 100 kW and the other two with a capacity of 50 kW 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 arrangements if the reliability of each generator is 0.95. **15**

Unit II

3. What do you understand by Reliability Prediction ? What is the main objective of reliability prediction ? Explain. Also classify the reliability prediction in detail. **15**
4. (a) A system consists of three units connected in series with reliabilities $R_1 = 0.70$, $R_2 = 0.80$ and $R_3 = 0.92$. It is designed that the reliability of the system be 0.65. How this is apportioned among, the three units using minimum effort method ?

Year	Cost of Maintenance
1	200
2	300
3	500
4	650
5	800
6	1000
7	1600
8	2100
9	2700

when should the machine be replaced ?

- (b) Write a short note on integration of reliability and capacity.

6. Explain availability and maintainability. Explain the types of availability in detail. **15**

Unit IV

7. (a) Consider an equipment with reliability 0.6. The desired reliability is approximately 0.85. The desired reliability level can be obtained either by improving the equipment reliability from 0.6 to 0.85 or by operating two identical equipments of reliability 0.6 each in parallel. Compare the cost incurred in both the cases.
- (b) Write a short note on delay related reliability. **15**
8. (a) The cost of a machine is \$15000 and its scrap value is \$1000. The maintenance costs of the machine (as found from the records) are as follows :