Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023

Semester : Semester VI - 2020
Course Code : MEC3015
Course Name : Sem IV - MEC3015 - Reliability Engineering
Program : MEC

Date : 14-JUN-2023
Time : 9.30AM - 12.30PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE FIVE QUESTIONS **5 X 2 = 10M**

1. Explain Mean Time To Failure. (CO2) [Knowledge]

2. Define Maintainability? (CO4) [Knowledge]

3. What is Reliability? (CO2) [Knowledge]

4. What are the causes of poor Maintenance? (CO1) [Knowledge]

5. List the various methods to estimate reliability? (CO1) [Knowledge]

PART B

ANSWER ALL THE SIX QUESTIONS **6 X 10 = 60M**

6. What are the various factors which affects the Maintainability? Discuss. (CO4) [Comprehension]

7. a) The probability of functioning of each element in a series system of four components is given as $R1$ = 0.6; $R2$ = 0.7; $R3$ = 0.8; $R4$ = 0.9. Find the overall reliability of the system. What will be the change the system reliability if the reliability of the third component is (a) increased to 0.9, and (b) decreased to 0.7.
b) The reliability of four components connected in a parallel set up are given as $R1$ = 0.6; $R2$ = 0.7; $R3$ = 0.8; $R4$ = 0.9. Find the overall reliability of the system. What will be the change the system reliability if the reliability of the third component is (a) increased to 0.9, and (b) decreased to 0.7.(CO3) [Comprehension]

8. How do you relate time-dependent failure rate of items which follows the shape of a bathtub?

(CO2) [Comprehension]

9. What are the main elements of Maintainability to be considered? Discuss.

(CO4) [Comprehension]

10. By considering any Industry how do you divide the Objectives of Maintenance in terms of Operational and Cost Objectives?

(CO1) [Comprehension]

11. Differenciate the Scheduled Downtime & Un-Scheduled Downtime with examples.

(CO2) [Comprehension]

PART C

ANSWER ALL THE TWO QUESTIONS **2 X 15 = 30M**

12. The reliabilities and corresponding costs of two sub components *A* and *B* of a system are given in the following table. Find all possible system reliabilities and their costs. Give your comments to estimate the most optimal reliability for the system composed of two components *A* and *B*. Find the combination of components such that (a) reliability should not be less than 85% (b) cost should not be more than Rs. 150/- with

Sub Component	Cost of Reliability		
	0.8	0.9	0.95
A	50	90	150
B	70	90	120

(CO3) [Application]

13. **a)** Consider a series of tests conducted under certain stipulated conditions on 600 electronic components. The total duration of the tests is 5 hours. The number of components that fail during each hourly interval is noted as shown in below table.

Time	1	2	3	4	5
Number of Failures	155	137	119	102	87

Calculate 1) Failure Density, 2) Failure Rate 3) Reliability & 4) Probability of Failure

b) Calculate the reliability of the following systems in which the probability of functioning of each component is given in the figure below

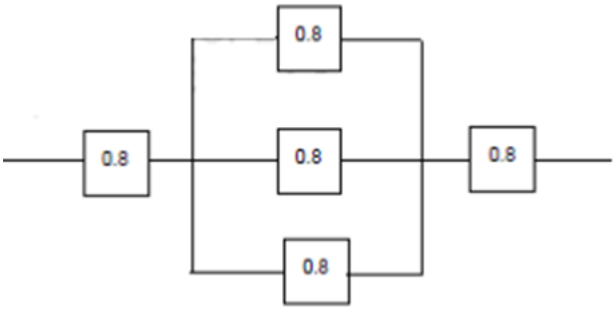

Figure (a)

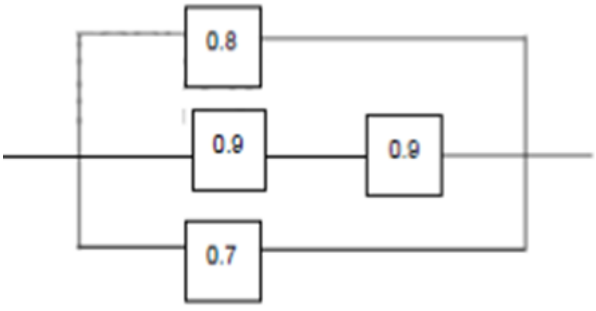

Figure (b)

(CO2) [Application]