

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VI MECHANICAL :SUMMER- 2022
SUBJECT : RELIABILITY ENGINEERING

Day : Thursday
 Date : 23-06-2022

S-13456-2022

Time : 02:30 PM-05:30 PM
 Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labelled diagram **WHEREVER** necessary
- 4) Use of non – programmable **CALCULATOR** is allowed.
- 5) Use suitable data **WHEREVER** necessary.

Q.1 Define : i) Hazard rate ii) MTTF iii) Failure density (10)
 iv) Mean time failure rate

OR

What is relationship between MTTF and Reliability?
 In the life testing of 10 elements of a mixture the time to failure for each elements is as follows. Calculate the mean failure rate for 905 hours and the mean time to failure for all the elements.

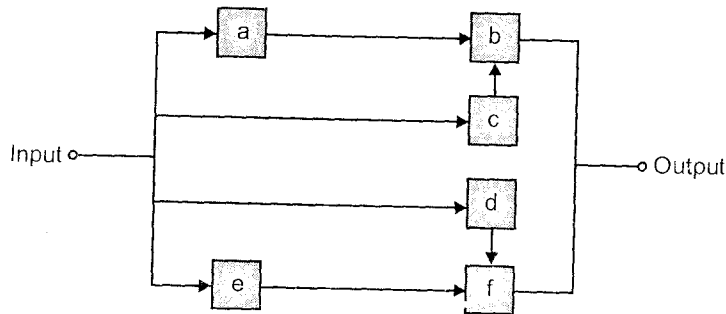
Element number	Time to failure in hours
1	800
2	805
3	810
4	815
5	820
6	827
7	838
8	848
9	875
10	905

Q.2 A cinema house gets electric power from a generator run by a diesel engine. (10)
 On any given day, the probability that the generator is down (event A) is 0.025 and the probability that the diesel engine is down (event B) is 0.04. What is probability that the cinema house will have power on any given day? Assume that the occurrence of event A and B are independent of each other.

OR

What is the difference between an experiment and event? Define the union and intersection of two sets.

Q.3 For following block diagram shown , calculate the reliability of the system (10)
 using tie set and cut set method. Also draw an equivalent block diagram for the minimal cut set and minimal tie set elements.



P.T.O.

OR

Write short notes on the following

- i) Active redundancy
- ii) Passive redundancy
- iii) Stand by redundancies

Q.4 State the assumptions to be made while using AGREE method. Find out the failure rates of the component so that the system reliability becomes 0.99 using AGREE method. The data is as follows (10)

Subsystem	Number of components modules	Operating time	Importance factor
1	25	10	1.0
2	80	09	0.97
3	45	10	1.0
4	60	07	0.95
5	70	10	1.0
6	20	10	0.95
	N = 300		

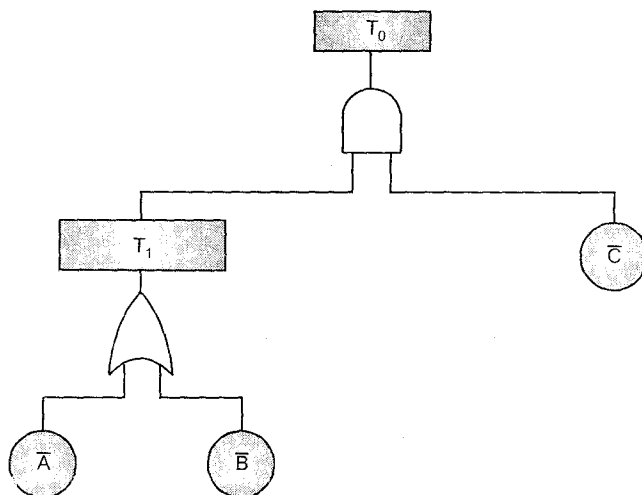
OR

Explain Maintainability and Availability. Also write a note on minimum effort method.

Q.5 What is purpose of constructing the fault tree diagram? Explain the symbols used while constructing the fault tree diagram. (10)

OR

A logic diagram for FMEA study has been shown in figure. The basic failure modes of A, B and C have failure rates 0.002, 0.003 and 0.004 per hour respectively. Find out the failure rate of T_0 . Assume a mission time of 100 hrs.



Q.6 Explain in brief the reliability tests conducted at various stages of life cycle. (10)

OR

A mechanical component is subjected to a mean stress of 207 N/mm^2 with a standard deviation of 55.2 N/mm^2 . The material has a mean strength of 276 N/mm^2 with a standard deviation of 41.4 N/mm^2

- i) Examine the probability of failure
- ii) If material is changed such that its mean strength is 380 N/mm^2 Find the probability of failure.

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