

**B.TECH. SEM -VI MECHANICAL 2014 COURSE (CBCS) :
SUMMER - 2018
SUBJECT: ELECTIVE-I: RELIABILITY ENGINEERING**

Day: **Monday**
Date: **11/06/2018**

S-2018-2442

Time: **02.30 PM TO 05.30 PM**
Max. Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat labeled diagrams **WHEREVER** necessary.
- 4) Assume suitable data wherever necessary

Q.1 In a survival test conducted on 100 cardboard boxes for their strength under impact loading, the following results were obtained: **(10)**

No. of impacts	20	22	24	26	29	32	35	37	40
No. of boxes failed	7	10	15	14	15	13	13	8	5

Calculate failure density, Hazard rate and reliability.

OR

Q.1 Write short notes on: **(10)**
 i) Reliability measures
 ii) MTBF and MTTF

Q.2 Explain normal and Weibull distribution stating their significance. **(10)**

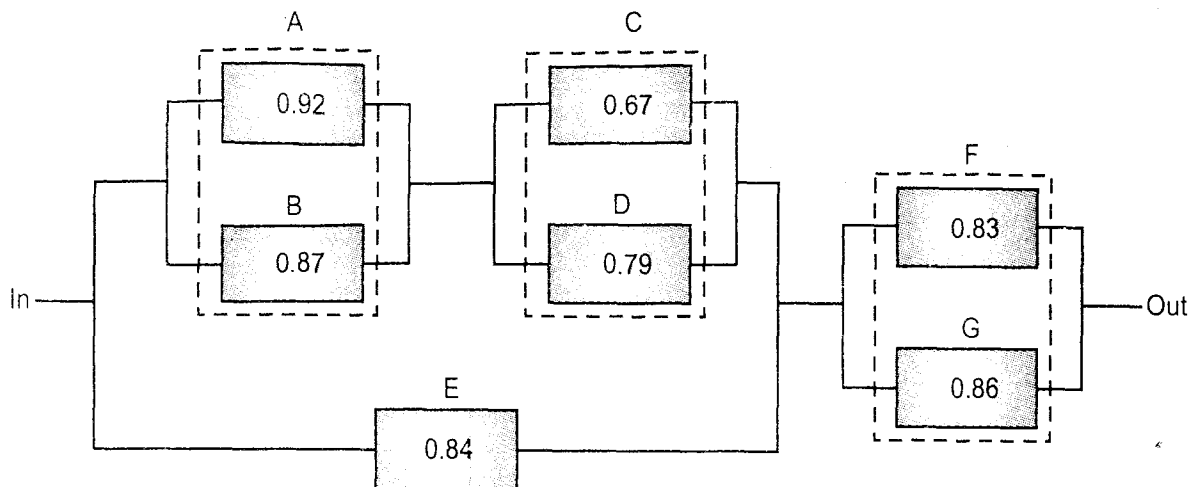
OR

Q.2 An aircraft landing gear has 4 tyres. Experience shows that tyre bursts occur on an average in one landing out of 1200. Assuming that tyre burst occur independently of one another and that of safe landing can be made if not more than 2 tyre burst, which is probability of unsafe landings. **(10)**

Q.3 Explain: **(10)**
 i) Active redundancy
 ii) Passive redundancy
 iii) Partially active redundancy

OR

Q.3 Calculate the reliability of the system shown in figure. **(10)**



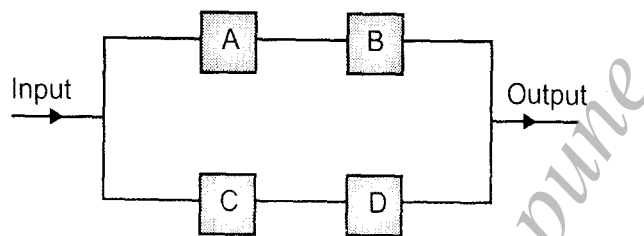
P. T. O.

- Q.4 a) Describe AGREE apportionment technique. (05)
 b) Explain minimum effort method to determine reliability. (05)

OR

- Q.4 Consider a system composed of three subsystem with the calculated failures rates of $\lambda_1 = 0.004$, $\lambda_2 = 0.006$, $\lambda_3 = 0.002$, Failures per hour respectively. The system mission time of 15 hours. A system reliability of 0.90 is required. Find the reliability requirements for the subsystems using ARINC apportionment method. (10)

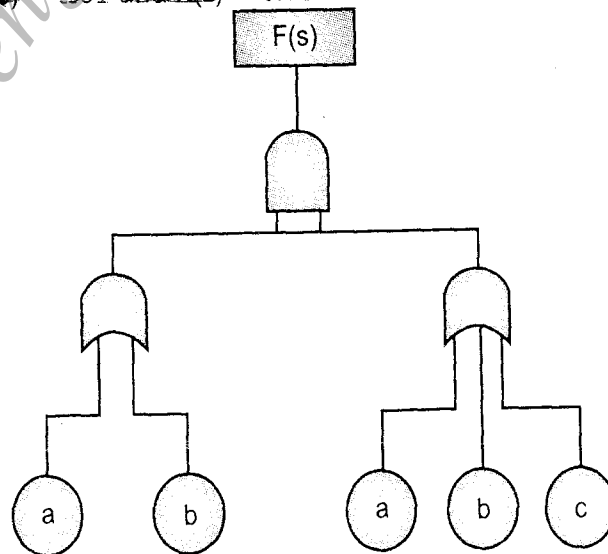
- Q.5 a) Construct fault tree diagram for the following system. (10)



- b) Compare FMEA and FMECA. Explain the steps and advantages of FMEA in minimizing potential failures.

OR

- Q.5 The fig shows a fault tree diagram. The failure rate of each element is given as $\lambda(a) = 0.025$, $\lambda(b) = 0.01$, $\lambda(c) = 0.005$. Failure per hours. Find out the failure rate of the system. (10)



- Q.6 a) Write difference between Accelerated life Testing and Highly Accelerated life testing. (05)
 b) Describe reliability testing. (05)

OR

- Q.6 Explain the Markov model. How it is applied in reliability analysis of a system having constant hazard rate? (10)