C. U. SHAH UNIVERSITY
Winter Examination-2019

Subject Name : Reliability Engineering

Subject Code : 5TE03REN1   **Branch: M.Tech Mechanical (CAD/CAM)**

Semester : 3   Date : 13/11/2019   Time : 02:30 To 05:30   Marks : 70

Instructions:
    (1) Use of Programmable calculator and any other electronic instrument is prohibited.
    (2) Instructions written on main answer book are strictly to be obeyed.
    (3) Draw neat diagrams and figures (if necessary) at right places.
    (4) Assume suitable data if needed.

SECTION – I

Q-1   **Attempt the Following questions**

a	Define MTBF with suitable example.	**01**
b	What do you mean by Reliability?	**01**
c	Define Availability of system	**01**
d	Define failure rate.	**01**
e	Explain probability of failure.	**01**
f	Explain in brief constant hazard model.	**01**
g	Draw bathtub curve used in reliability with usual notation.	**01**

Q-2   **Attempt all questions**

a	Draw the block diagram of Parallel-Series system and explain.	**05**
b	What is the importance of the Weibull distribution in reliability? Explain with necessary formulae.	**05**
c	What is the difference between reliability and quality? Discuss.	**04**

OR

Q-2   **Attempt all questions**

a	Draw Reliability Block Diagram and explain.	**07**
b	Assume we have an automobile that is operating in its mature phase and has the following failure history: Time to failure (hours): 100 800 1280 2600 The MTBF is given by: [100+800+1280+2600] / 4 = 1195 hours/failure This gives a constant failure rate of: 1 / 1195 = 0.000836 failures/hour. What reliability can be expected from the automobile after 40, 200, 1000, and 5000 hours?	**07**

Q-3 **Attempt all questions**

a For the following network shown in figure 1, derive an expression for the system reliability in terms of the component reliabilities. Also compute the system reliability if R= 0.9. **07**
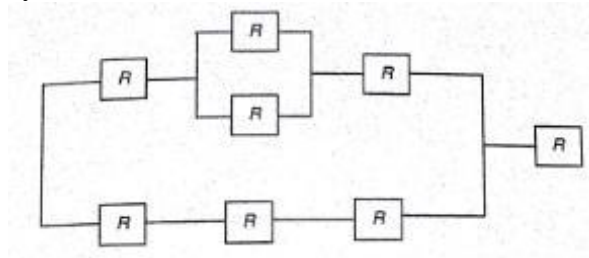

Figure 1

b Write the different responsibility of the reliability engineer. **04**
c Write short note on "Reliability certification". **03**

OR

Q-3 **Attempt all questions**

a A system consists of four components. If more than two of the components fail, the system fails. If the components have an exponential time-to-fail distribution with a failure rate of 0.000388, what is the reliability of the system at time = 300? **07**
What is the system mean time to fail?

b What do you mean by K – Out – Of – M – Configuration structure in system reliability? **07**

SECTION – II

Q-4 **Attempt the Following questions**

a Define fault tree. **01**
b What do you mean by Reliability Allocation? **01**
c Define Maintainability. **01**
d Write the full name of FMECA. **01**
e What is Derating? **01**
f What is Accelerated life testing? **01**
g What impact reliability and maintainability would have on availability? **01**

Q-5 **Attempt all questions**

a Write the name of different reliability improvement and risk reduction methods and explain it. **07**
b Outline the symbology of faulty trees and explain. **07**

OR

Q-5 **Attempt all questions**

a Write a short note on MTTF in terms of failure density. **07**
b What are the factors to be considered while designing a life test? Explain the term "burn-in-tests". **07**

Q-6 **Attempt all questions**

a Enlist the various methods of reliability improvement. Explain any two. **07**
b Construct a fault tree diagram of automobile engine by considering a top event as "engine will not start". **07**

Q-6 **Attempt all Questions**

a   Explain Redundancy Techniques used in System Design.   07

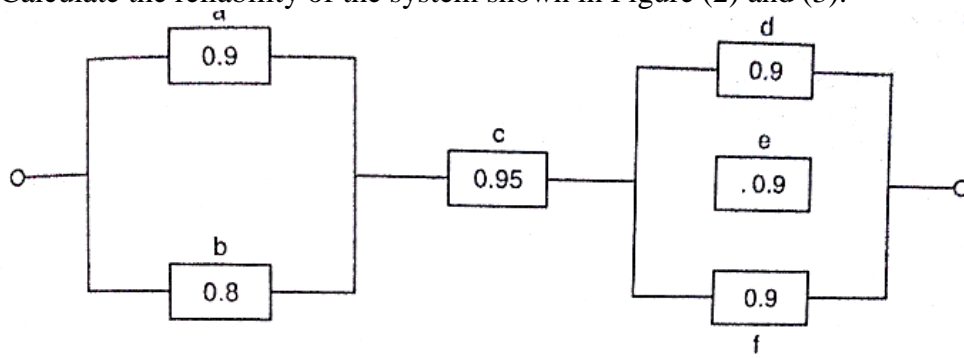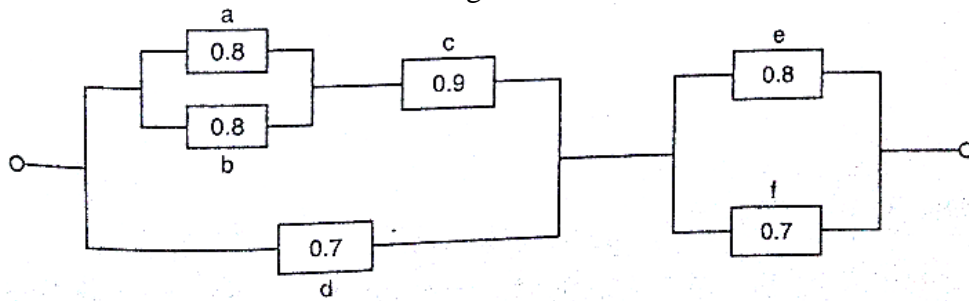b   Calculate the reliability of the system shown in Figure (2) and (3).   07

a
0.9

c
0.95

d
0.9

e
.0.9

b
0.8

f
0.9

Figure 2

a
0.8

0.8
b

c
0.9

e
0.8

f
0.7

0.7
d

Figure 3