C.U.SHAH UNIVERSITY
Winter Examination-2015

Subject Name : Reliability Engineering

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

Semester : 3   Date : 22/12/2015   Time : 2.30 To 5.30   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 failure rate.	**(01)**
b.	Explain in brief constant hazard model.	**(01)**
c.	It is observed that the failure pattern of an electronic system follows an exponential distribution with mean time to failure of 1000 hours. What is the probability that the system failure occurs within 750 hours?	**(01)**
d.	Define Availability of system.	**(01)**
e.	Define MTBF with suitable example.	**(01)**
f.	Explain probability of failure.	**(01)**
g.	Define MTTR.	**(01)**

Q-2   **Attempt all questions**

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

OR

Q-2   **Attempt all questions**

a.	Draw the state transition diagrams for one unit system and two unit series system.	**(05)**
b.	The failure rates of three components are 0.065×10^{-3}, 0.18×10^{-3} and 0.96×10^{-3} per hour. Evaluate the reliability of a system at 500 hours if these components are connected in series.	**(05)**
c.	What do you mean by r-OUT-OF-n structure in system reliability?	**(04)**

Q-3   **Attempt all questions**

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a.	Evaluate the equation of MTTF for two unit redundant system using Markov process. Using the same equation calculate MTTF of a system whose failure rate of the unit $\lambda = 0.58 \times 10^{-4}$ per hour.	**(07)**
b.	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	**(07)**

reliability if R= 0.9.
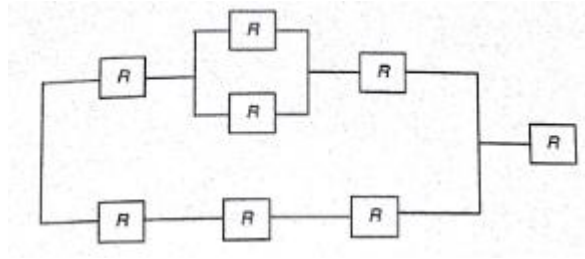
Figure 1

OR

Q-3   **Attempt all questions**

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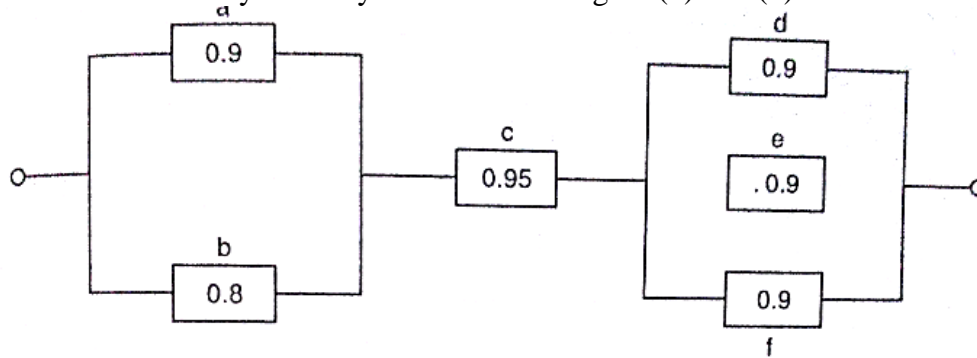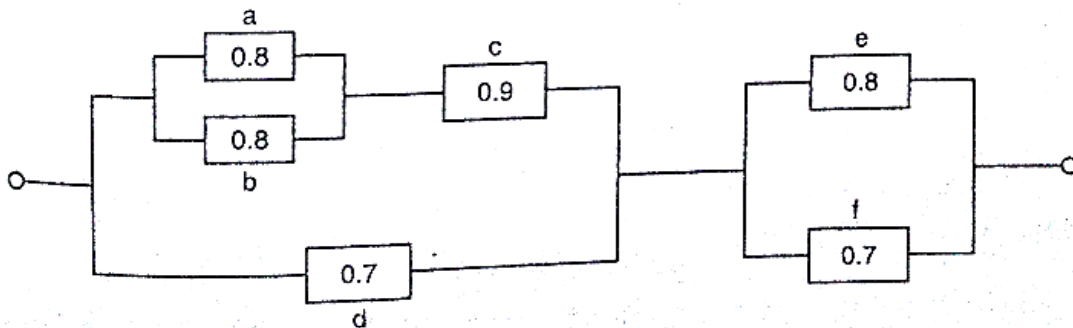

Figure 2

Figure 3

     b. Prove that in mathematical terms, the hazard rate is the ratio of instantaneous probability density function to the instantaneous reliability function.   **(07)**

SECTION – II

Q-4   **Attempt the Following questions**

     a. What do you mean by 'redundancy'?   **(01)**

     b. Write any one reliability standard with its description.   **(01)**

     c. Explain in brief Derating.   **(01)**

     d. Define fault tree.   **(01)**

     e. Write the full name of FMECA.   **(01)**

     f. Define Maintainability.   **(01)**

     g. Give the full name of HASS.   **(01)**

Q-5   **Attempt all questions**
- **a.** What are the factors to be considered while designing a life test? Explain the term 'burn-in-tests'. **(05)**
- **b.** Explain in brief tie-set and cut-set methods used to compute reliability. **(05)**
- **c.** Explain the role of reliability engineer. **(04)**

OR

Q-5   **Attempt all questions**
- **a.** Write the characteristics of impact of terotechnology on maintenance management. **(05)**
- **b.** Outline the symbology of faulty trees and explain. **(05)**
- **c.** Write short note on "Reliability certification". **(04)**

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)**

OR

Q-6   For an emergency operation theatre in a hospital, the power is obtained from the main city supply through a transformer connected in series. To ensure an uninterrupted supply, an auxiliary generator is also used with a suitable switch-over. The probability of failure of the city supply is 0.01 and the transformer reliability is 0.996. The auxiliary power generator has a reliability factor is 0.99. Draw the block diagram for the system. Construct the fault tree and based on this calculate the reliability of the system. **(14)**

Also calculate the reliability of the system if auxiliary generator is not attached. Give your comments.