Code No: 07A70207 | R07 | SET-1

B.Tech IV Year I Semester Examinations, December-2011
RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

1.a) Define Reliability and discuss about the discrete random variables and continuous random variables.

b) In a sample of 100 nails, 10 are found to be defective of the head, 15 are found to be defective of the tail, 25 are found to have both the defects. What is the probability of packing a nail without any defect? [8+8]

2.a) Explain Binomial distribution.

b) In a certain manufacturing process, one percent of the products are known to be defective. If 50 items are purchased by a customer, what is the probability of getting two or less number of defectives? Use Poison distribution to solve the problem. [8+8]

3.a) Explain Weibull distribution with graphs.

b) A component has a reliability of 0.9 for a mission time of 50 hrs. What is the reliability for a mission time of 100 hrs and 500 hrs? [8+8]

4.a) Explain how reliability is evaluated for a system with (r/n) configuration?

b)

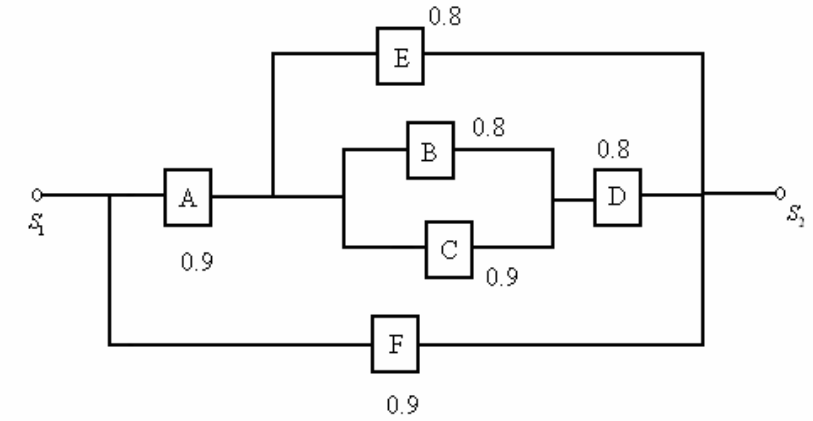

Fig: 1

Calculate the reliability of the above system with Network reduction method as shown in figure 1. [8+8]

5. A system consists of two identical components with independent failures, but only one repair facility. When one component is down, if the other component fails, it may have to wait.

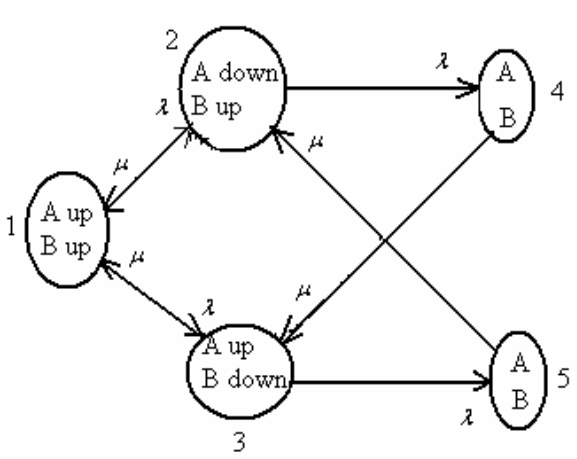

Fig: 2

Calculate the steady state probabilities for this state space diagram as shown in figure 2**.** [16]

6.a) Explain how Cumulative probability and Cumulative frequency evaluation is done for merged states by examples.

b) Explain LOLP, LOLE for generation system reliability analysis. [8+8]

7.a)

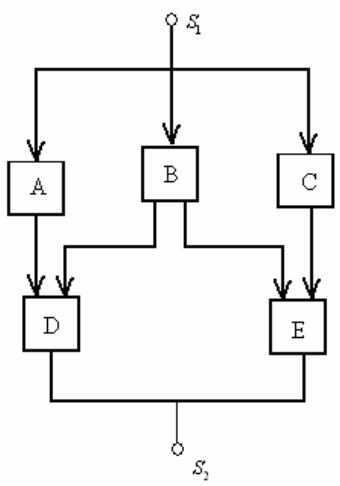

Fig: 3

Estimate the reliability of the system if each component has a reliability of 0.9 and choose 'B' as the critical component as shown in figure 3.

b) Define the following terms:
a) Tie sets b) Cut sets c) Minimal Cut Sets d) Minimal tie Sets. [8+8]

8. Write short notes on:
a) Reliability indices evaluation for Radial Networks in distribution systems.
b) Decomposition method for composite systems.
c) Frequency and duration concept
d) Markov chains. [16]

Code No: 07A70207 | R07 | SET-2

B.Tech IV Year I Semester Examinations, December-2011
RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

1.a) Define Reliability and discuss about the probability density function, Cumulative probability distribution function of a continuous random variables.
b) Explain conditional probability, with an example. [8+8]

2.a) Explain Poisson's distribution.
b) In a certain manufacturing process, one percent of the products are known to be defective. If 50 items are purchased by a customer, what is the probability of getting two or less number of defectives? Use binomial distribution. [16]

3.a) Explain Exponential distribution with graphs.
b) A large number of identical relays have T with Weibull distribution with β =0.5 and α =10 years. What is the probability that a relay will survive:
a) 1 year b) 5 years c) 10 years. [16]

4. A 3 in 1 music system is shown in figure 1. The reliabilities of each component are given in the figure. Calculate the reliability of the system in the following modes of operation:
a) Stereo record b) Mono cassette player c) Radio receiver. [16]

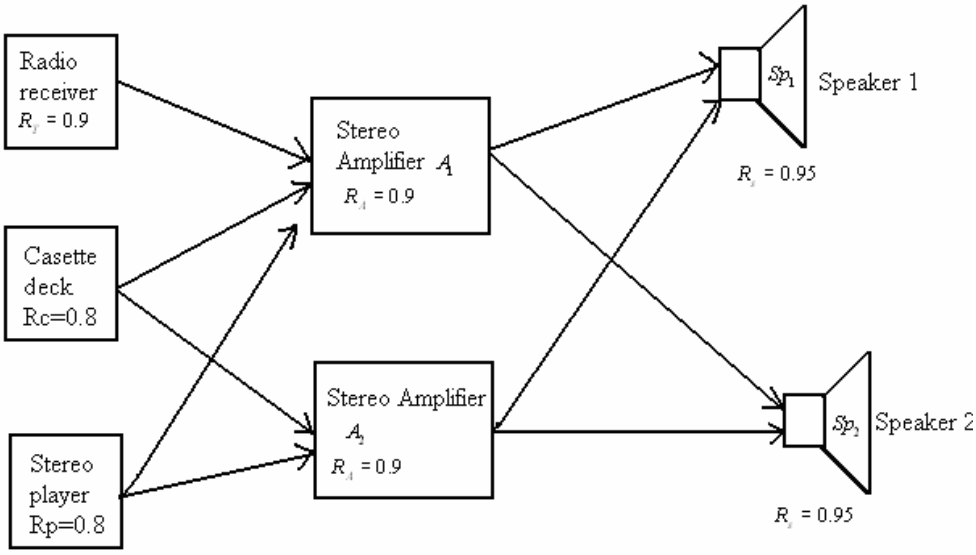

Fig: 1

5. The state space diagram of a system is shown in figure 2. Merge the states 2 & 3 to form state 23. Calculate probability, arrival and departure rate for this lumped state. [16]

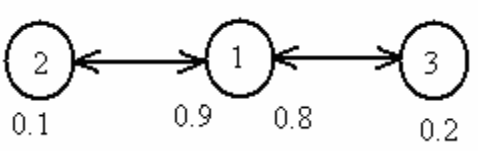

Fig: 2

6.a) Explain Minimal tieset method for reliability evaluation.

b) Calculate the reliability of the bridge Network using Minimal Cut Set method as shown in figure 3. If each component reliability is 0.9. [8+8]

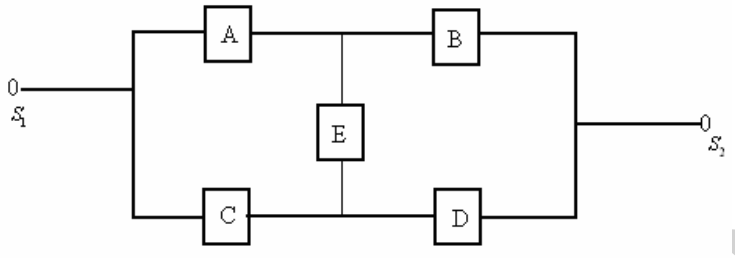

Fig: 3

7.a) Explain the reliability model of a generation system.

b) Explain the Decomposition method for the analysis of composite system reliability. [8+8]

8. Write short notes on:

a) Distribution system reliability indices evaluation.

b) LOLP, LOLE for generation system.

c) Frequency and duration concept

d) Laplace Transform approach for evaluation of probability. [16]

******

Code No: 07A70207 | R07 | SET-3

B.Tech IV Year I Semester Examinations, December-2011
RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

1.a) Define Reliability and explain what are the important aspects of the definition of reliability needs careful consideration?
b) Define probability and give an example for conditional probability. [8+8]

2.a) Explain Binomial distribution.
b) A switch board receives on an average 60 calls per hour. If the operator is away for ½ minute, what is the probability, that there is no call during her absence? [8+8]

3.a) Explain the Bath Tub curve.
b) The hazard function of a component follows the Weibull distribution with λ=0.05 /hr and β = 0.5 Calculate MTTF. What is the reliability for a Mission time of 100 hrs? [8+8]

4. A four engine aircraft can operate only if at least 2 engines are working. It has two generators driven by the engines, each one of which can supply the Minimum load demand. Write down the various system configurations possible and compare reliabilities.
Reliability of engine $R_E = 0.8$
Reliability of generator R_g =0.9 [16]

5.a) For the following state space diagram as shown in figure 1.

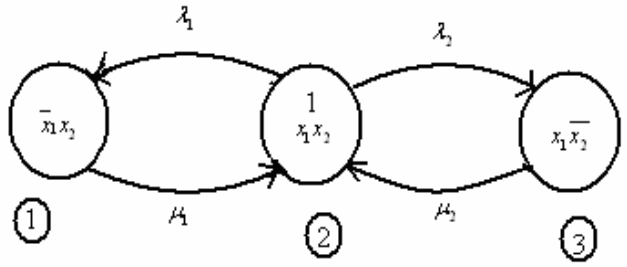

Fig: 1

Write the transition intensity matrix 'T' and derive the steady state probabilities and state frequencies.
b) If $\lambda_1 = 0.02$ $\lambda_2 = 0.04$ $\mu_1 = 0.98$ $\mu_2 = 0.96$
Calculate steady state probabilities. [8+8]

6.a) A bridge Network is shown in figure 2. Calculate the system reliability if each component has a reliability of a 0.9 value, using minimal tie set method.

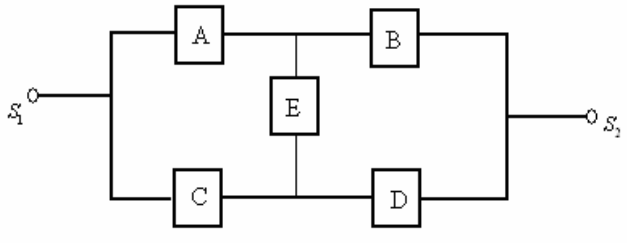

Fig: 2

b) Explain the Minimal Cut set method for reliability evaluation. [8+8]

7.a) Define Mean cycle time, and how it can be calculate for one and two component repairable model?

b) Explain the Reliability Model of a generation system. [16]

8. Write short notes on:

a) Evaluation of Reliability indices for distribution systems.
b) Decomposition method for composite systems.
c) LOLP and LOLE for generation systems.
d) Markov chains. [16]

******

Code No: 07A70207 | R07 | SET-4

B.Tech IV Year I Semester Examinations, December-2011
RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

1.a) Define Reliability and probability of a system.
b) A factory gets electric power from a generator (G) driven by a diesel engine (E). If the probability of failure of the (G) is 0.1 and that of (E) is 0.2, what is the probability of the system working satisfactorily? [16]

2.a) Explain Poisson's distribution.
b) Explain the following terms with respect to binomial distribution:
a) Mean value b) Mode c) Variance d) Standard deviation. [16]

3.a) Derive the relation between F(t), h (t), and R(t).
b) The h (t) of a component is given by h (t) = $\frac{1}{\sqrt{t}}$ deduce R (f), f (t), F (t) mean(t) and var.(t). [16]

4. A computer system consists of three subsystems in series with their reliabilities are:
Card reader Rcr = 0.8, CPU (Rc =0.98), printer (Lp) Rp = 0.9
What is the reliability of the system if it consists of one subsystem of each type? [16]

5.a) Explain two-state Markov process. (Single component with repair) and derive the equations for steady state probabilities.
b)

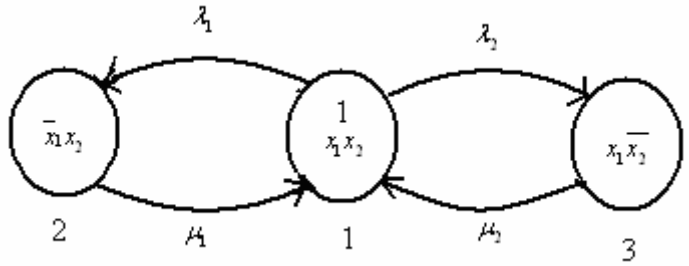

Fig: 1

Write the Transition intensity Matrix 'T' for the above state diagram as shown in figure 1. [16]

6.a) Explain the Decomposition method of evaluate the composite systems reliability analysis.
b) Explain LOLP, LOLE, in generation system Reliability analysis. [16]

7.a) Explain how reliability analysis performed for the Radial Networks in distribution systems.

b) Explain the Reliability Model of a generation system. [16]

8. Write short notes on:
a) Cumulative probability analysis for generation system reliability.
b) Reliability indices of a composite system.
c) Frequency and duration concept
d) Markov chains. [16]

******