

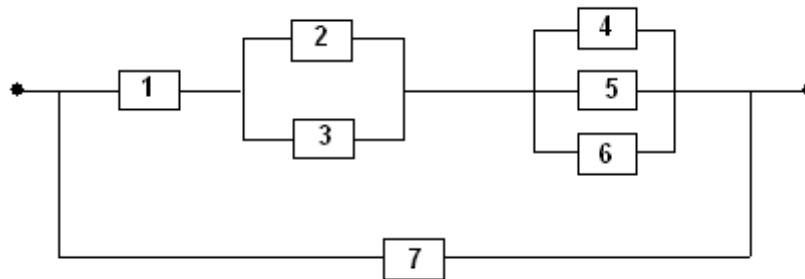
IV B.Tech II Semester Supplementary Examinations, April/May 2005
POWER SYSTEMS RELIABILITY
(Electrical & Electronic Engineering)

Time: 3 hours

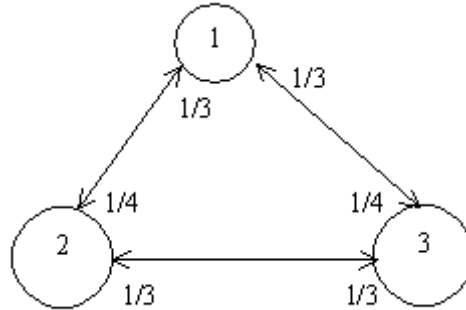
Max Marks: 70

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What is a random variable? Discuss briefly any two continuous distributions applicable in reliability engineering ?
 (b) A lot containing 7 components is sampled by a quality inspector ; the lot contains 4 good components and 3 defective components. A sample of 3 is taken by the inspector . Find the probable value of number of good components in this sample.
2. (a) Prove that for the Poisson distribution $\frac{f(x+1;\lambda)}{f(x;\lambda)} = \frac{\lambda}{x+1}$ for $x = 0, 1, 2, \dots$
 (b) The life in years of certain type of electrical switch has an exponential distribution with an average life of $\beta=2$. If 100 of these switches are installed in different systems, what is the probability that at most 30 fail during first year?
3. (a) Classify various types of redundant configurations and explain.
 (b) Derive a general expression for the reliability of the system whose reliability logic diagram is shown in figure.
 - i. Consider the case in which out of the components 4,5,6 at least two of them must function for the system success. Hence evaluate the system reliability if each component has a probability of success of 0.8
 - ii. if all the components were to be fully redundant , what will be the system reliability?



4. (a) Discuss the discrete , stochastic,ergodic process for the three time intervals using state diagram and develop the recursive relation for state probability for single component repairable model.
 (b) Evaluate the limiting state probabilities associated with the following figure :



5. (a) What is the “need of rounding off of capacities in estimating the probabilities of a system”. Explain how they are evaluated.
 (b) Consider that there are four identical generators of 4 MW each having unavailability of 0.12. Determine the rounding off capacity outage probability table when rounded to 5 MW.
6. (a) Explain what is meant by outage replacement rate.
 (b) Explain what is meant by ‘area risk curves’.
 (c) Explain how rapid start units are modeled. Develop the state space model and write the stochastic transitional probability matrix for the same.
7. (a) Find the minimum number of redundant components each having reliability necessary to achieve a system reliability of 0.95. There is a common mode failure probability of 0.03.
 (b) Derive the expression for the MTTF for the load sharing system as defined.
8. (a) Consider the following two systems
 System A: 6×50 MW —FOR= 4%
 Peak load 240 MW
 System B: 6×100 MW —FOR= 6%
 Peak load = 480 MW
 The two systems are interconnected by a 50 MW tie line. Calculate the loss of load expectation in each of the system on a one-day basis for the above data.
 (b) Explain the factors in brief affecting emergency assistance available through the interconnections.
