



## FACULTY OF ENGINEERING

B.E. 4/4 (E &amp; EE) II – Semester (Main) Examination, May / June 2012

Subject : Power System Reliability (Elective – III)

Time : 3 hours

Max. Marks : 75

**Note:** Answer all questions from Part–A and answer any FIVE questions from Part–B.

## PART – A (25 Marks)

1. Define random variable of a system and give two examples. 2
2. A discrete probability distribution is given by  
 $f(x_n) = A_n \quad n = 0, 1, 2, 3, 4, 5,$   
Determine i) mean ii) Probability that  $x \leq 3$  iii)  $\mu$  3
3. For the network shown in Fig.1 derive an expression for the system reliability in terms of the component reliability. 3

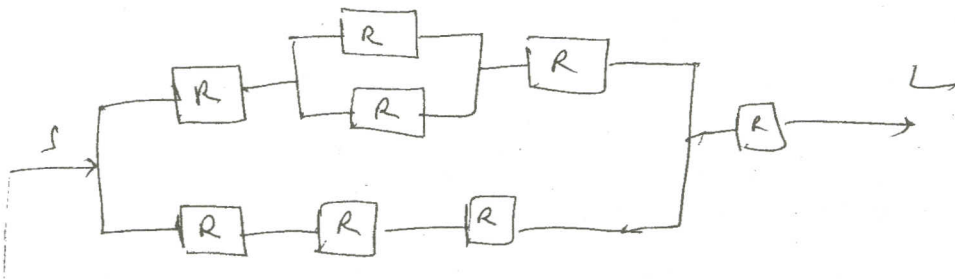


fig.1

4. Deduce the relationship between  $F(t)$ ,  $f(t)$  and  $R(t)$ . 2
5. What do you mean by absorbing state of a system? 2
6. Determine STPM for the system shown in fig.1. 3

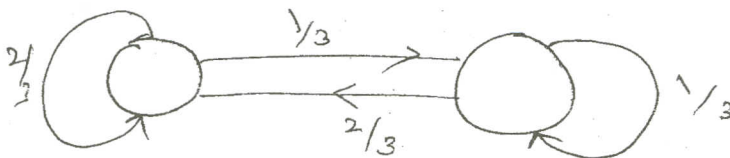


fig.2

7. Define availability and unavailability of the generating unit. 2
8. Write the important capacity outage probability tables. 2
9. Define SAIDI, ASAI and CAIDI of a distribution system. 3
10. Is the reliability of a power system power quality issue? If yes. explain it. 3

## PART - B (50 Marks)

- 11.a) Obtain mean value and standard deviation of a Poisson distribution. 7
- b) The probability of success in a single trial is 0.1 calculate the probability that in 10 trials there will be exactly two successes using binomial distribution. 3
- 12.a) Obtain the reliability of a system shown in fig.3 using Cut Set method. 7

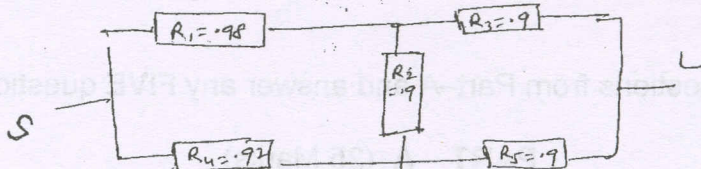


fig.3

- b) Define MTTF and MTBF of a system. 3
- 13.a) A system contains a series string of components for which  $\sum \lambda = .005$  f/hr. What is the reliability of this system for a mission time of 10 hrs? If a similar system is placed in parallel what is the reliability of the configuration for a 10 hr mission. 3
- b) A mission components, two of which must operate for system success. If the failure rates are .01, .05 and 0.1 f/106 hr, construct the STPM and hence evaluate the MTTF of the system. 7
- 14.a) Explain in detail recursive relation for capacitive model building. 5
- b) A generating station consists of three units as 2 x 20 MW ; 1 x 40 MW ; for each unit the failure rate  $\lambda$  is  $.3 \text{ yr}^{-1}$  and the repair rate  $9.7 \text{ yr}^{-1}$ . Develop the capacity outage probability table. 5
- 15.a) Write the significance of primary and secondary reliability of electric distribution system. 3
- b) Obtain the reliability of a substation show in fig.4. 5

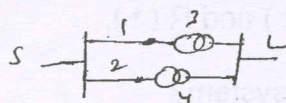


Fig-4

$$\lambda_1 = \lambda_2 = .001 \text{ f/nr}$$

$$\lambda_3 = \lambda_4 = .002 \text{ f/nr}$$

- 16.a) Explain in detail about Bath-tub curve. 5
- b) Obtain the reliability of the system shown in fig.5 the reliability of each component is .92. 5

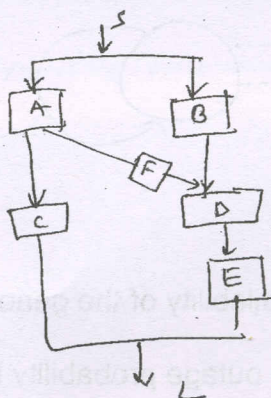


Fig-5

17. Write short notes on :
- a) Normal distribution 4
- b) Causes of failures 3
- c) 2-level daily load representation 3