

**R09**

Code: 9A02708

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013  
**RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS**  
(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions  
All questions carry equal marks

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- 1 (a) Show that under certain conditions a binomial distribution can be approximated by a Poisson distribution.  
(b) An electric motor consists of two parts, namely stator and rotor. They are manufactured in two different sections and assembled together. The probability that stator is defective is given as 0.06 and rotor defective is given 0.09. What is probability that an assembled motor will not be defective?
- 2 (a) Distinguish with block diagrams parallel series and mixed parallel series systems and write down appropriate formula in each case.  
(b) Assume that six units can be arranged in three series and parallel configuration. Draw their block diagram of arrangement and estimate reliability of the system if each has reliability of 0.85.
- 3 (a) Explain the following terms:  
(i) Reliability. (iii) MTTR.  
(ii) MTTF. (iv) MTBF.  
(b) Show that for exponential distribution, MTTF is the reciprocal of failure rate.
- 4 (a) Explain two state Markov process for calculation of steady state probabilities.  
(b) Explain the state space method of system reliability evaluation.
- 5 A generating station has three generators, two rated for 10 MW and third one rated for 20 MW. The failure and repair rates of each unit are 0.35 failures/year and 9.65 repairs/year. Obtain the state diagram and mark the various equivalent transitional rates of equal capacity states combined. Hence evaluate the cumulative probability of various combined states.
- 6 (a) Explain the method of calculating LOLP of a generating system. What are the inadequacies of LOLP as an index of unreliability?  
(b) A power system contains three 40 MW and one 60 MW capacity unit each having a forced outage rate of 0.02. The annual daily peak load variation curve is a straight line from 100% to 40% points. Estimate LOLE for a peak load of 200 MW.
- 7 (a) Explain the weighted average rate model for considering weather effect on transmission lines for reliability analysis.  
(b) Discuss the various load points reliability indices that are used for radial distribution networks.
- 8 Write short notes on:  
(a) Bath-Tub curve.  
(b) State space diagram.  
(c) Standard deviation of binomial distribution.  
(d) Cumulative frequency failure evaluation.

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