(Time: 3 Hours)

Please check whether you have got the right question paper.

Total Marks – 80

N.B.:- (1) Question No.**1** is compulsory.

(2) **Attempt** any **three** questions out of remaining **five** questions.

(3) Assume necessary data wherever necessary.

Q 1.	Answer the following questions.	**20**
a)	Write short note on different types of outages that occur in power system.	**5**
b)	Prove that instantaneous hazard rate $\lambda(t) = \dfrac{f(t)}{R(t)}$	**5**
c)	Draw a two state model of equipment. Define failure rate and repair rate	**5**
d)	What do you understand by spinning reserve and operating reserve.	**5**

Q 2 a)	Categorize loads in power system. Explain Load growth characteristics for various loads.	**10**
Q 2 b)	What do you understand by system planning. Explain main aims of Long Term and Short term planning.	**10**

Q 3 a)	Explain different mathematical approaches to load forecasting.	**10**
Q 3 b)	Explain in detail reactive power planning.	**10**

Q 4 a) Find reliability of system shown in figure-1 using minimum cut set **10** method if reliability of each component is 0.9
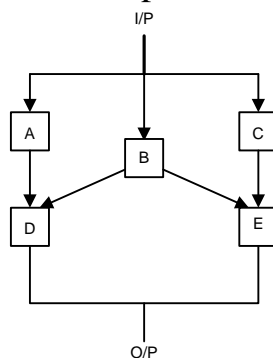

Figure-1

Q 4 b)   A generating system contains three 25 MW generating units each **10**
          with FOR = 4% and one unit of 30MW unit with FOR=5%.
          Prepare capacity outage table.

Q 5 a)   What is the importance of Markov Process in reliability of power **10**
          system. Derive the expression of availability and unavailability
Q 5 b)   Explain Modified PJM method in detail.   **10**

Q 6 a)   A generating system consists of 2 units of 30MW and 1 unit of **10**
          60MW with λ=0.01f/day and repair μ= 0.49 r/day. Construct
          generation model. Also, find rate of departure and frequency of
          occurrence of each capacity outage state.

Q 6 b)   A power system is having 5 units of 100MW units each with FOR= **10**
          0.03. Find loss of Energy Expectation (LOEE) and EIR. The peak
          load is considered to be 400 MW and base load is 150MW.