(Time: 3 Hours) **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.

1. Attempt the following 20
   a) State the objectives of transmission system planning.
   b) Draw bath tub curve and define all three regions in it.
   c) Show that M.T.T.F. is reciprocal of failure rate λ
   d) What is operating reserve. Define Outage Replacement Rate (O.R.R.)

2. a) Describe the various data requirements for composite system reliability evaluation. 10
   b) Explain frequency and duration method and hence explain the concept of rate of departure. 10

3. a) Differentiate in Short term, Medium term and Long term planning. 10
   b) Explain two state Markov model and derive the expression of availability and unavailability. Draw the state space model for three units indicating all transition rates. 10

4. a) A generating system consists of the following units: 10
   1*10MW units with FOR of 0.08
   1*20MW units with FOR of 0.08
   1*30MW units with FOR of 0.08
   1*40MW units with FOR of 0.08
   Calculate LOLE for this system for a single daily peak load of 60MW.
   b) A generating system contains 3*25MW units each with a 4% FOR and 1*30MW unit with a 5% FOR. If the peak load for a 100 day period is 75MW, what is the LOEE for this period? Assume that the appropriate load characteristic is a straight line from the 100% to the 80% points. 10

5. a) Explain PJM method in detail 10
   b) What is reactive power planning? What are the methods used for reactive power planning? 10

6. a) Explain in details various factors affecting generation planning ? 10
   b) What is Load forecasting ? Describe different techniques used for load forecasting. 10
