

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**IV B. Tech I Semester Advanced Supplementary Examinations March 2025****POWER SYSTEM OPERATION AND CONTROL**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

UNIT-I

1. a) Explain the following terms with reference to thermal plants [7M]
i) Heat rate curve ii) Cost curve
- b) Determine the incremental cost of received power & the penalty factor of the plant, if the incremental cost of production is $dC_1/dP_{g1} = 0.1P_{g1} + 3 \text{ Rs./MWh}$. [7M]
($P_L = 2 \text{ MW}$ & $P_g = 10 \text{ MW}$)

(OR)

2. a) Explain the following terms with reference to thermal plants. [7M]
i) Incremental fuel cost & ii) Incremental production cost
- b) Determine the penalty factor of plant-1, for a system consists of two generating plants with fuel costs of: [7M]

$$C_1 = 0.03P_1^2 + 15P_1 + 1.0$$

$$C_2 = 0.04P_2^2 + 21P_2 + 1.4$$

The system operates on economic dispatch with 150MW of power generation by each plant. The incremental transmission loss of plant-2 is 0.2..

UNIT-II

3. a) Describe dynamic programming method [7M]
- b) Calculate the most economical units to be committed to supply a load of 4 MW by using dynamic programming method for three units with the following data. [7M]

The maximum and $C_1 = 0.6P_1^2 + 20P_1$, $C_2 = 0.85P_2^2 + 19P_2$ and $C_3 = 0.7P_3^2 + 25P_3$ minimum capacities of each unit are 5 MW and 1 MW respectively.

(OR)

4. a) Describe the advantages of hydro-thermal combinations [7M]
- b) Calculate generation schedule, daily water used by hydro plant & daily operating cost of thermal plant ($\gamma_j = 85.5 \text{ Rs/m}^3\text{-hr}$) for a two plant system having a steam plant near the load center & a hydro plant at a remote location. [7M]
The load is 500 MW for 16 hr a day & 350 MW for 8 hr a day.

The characteristics of the units are

$$C_1 = 120 + 45P_{gt} + 0.075P_{gt}^2$$

$$W_2 = 0.6P_{gh} + 0.00283P_{gh}^2 \text{ m}^3/\text{s} \text{ \& Loss Coefficient } B_{22} = 0.001 \text{ MW}^{-1}$$

UNIT-III

5. a) Illustrate steady state analysis of controlled case in a single area control system? [7M]
b) Analyze the proportional plus integral control of single area control system? [7M]

(OR)

6. a) Illustrate the modelling of Generator-Load model? [7M]
b) Compare the steady state & dynamic operations of an isolated system? [7M]

UNIT-IV

7. a) Illustrate Load frequency & economic dispatch control of two-area system? [7M]
b) Derive the expression for Tie-line power in an identical two-area system? [7M]

(OR)

8. a) Compare the differences between uncontrolled & controlled case of a two-area system? [7M]
b) Describe the block diagram of a two-area system? [7M]

UNIT-V

9. a) Explain overview of reactive power control. [7M]
b) Illustrate the specifications of load compensator? [7M]

(OR)

10. a) Analyze reactive power compensation in transmission systems? [7M]
b) Explain the advantages & disadvantages of different types of compensating equipments. [7M]
