

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

IV B. Tech I Semester Regular/Supplementary Examinations October 2025

POWER SYSTEM OPERATION AND CONTROL

(EEE)

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) Input-output characteristics & ii) Incremental fuel cost
- b) Calculate 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 120MW of power generation by each plant. The incremental transmission loss of plant-2 is 0.15.

(OR)

2. a) Explain the following terms with reference to thermal plants. [7M]
i) Heat rate curve & ii) Incremental production cost
- b) Explain about loss coefficients in detail. [7M]

UNIT-II

3. a) Illustrate mathematical formulation of hydro-thermal scheduling? [7M]
- b) Discuss solution techniques of Hydro-thermal scheduling. [7M]

(OR)

4. a) Explain priority ordering method. [7M]
- b) Analyze dynamic programming method in detail? [7M]

UNIT-III

5. a) Calculate the change in frequency for a 125 MVA turbo-alternator operates on full load operates at 50 Hz & a load of 50 MW is suddenly reduced on the machine. The steam valves to the turbine commence to close after 0.5sec due to the time lag in the governor system. Assuming the inertia to be constant, H=6 kw-s per KVA of generator capacity. [7M]
- b) Illustrate steady state Analysis of single area with its block diagrams? [7M]

(OR)

6. a) Describe mathematical modelling of speed governing system? [7M]
- b) Illustrate Proportional plus Integral control of single area and its block diagram representation? [7M]

UNIT-IV

7. a) Illustrate Tie-line bias control in detail? [7M]
b) Calculate the frequency of oscillations of tie-line power deviation for a two-identical area system given the following data. [7M]
R=3Hz/p.u, H=5sec, f=60Hz, tie-line capacity=0.1p.u,
power angle=45degrees.

(OR)

8. a) Explain block diagram development of load Frequency control of two area system for controlled case. [7M]
b) Discuss load frequency control and economic dispatch control. [7M]

UNIT-V

9. a) Explain reactive power compensation in transmission systems. [7M]
b) Describe Load compensation in detail? [7M]

(OR)

10. a) Explain the need of FACTS controllers. [7M]
b) Discuss specifications of load compensator in detail. [7M]
