

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
IV B. Tech I Semester Regular/Supplementary Examinations OCT/NOV 2025
CONCEPTS OF POWER SYSTEM ENGINEERING
(OPEN ELECTIVE)

Time: 3 hours

Max. Marks: 70

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

All Questions Carry Equal Marks

UNIT-I

1. a) With neat sketch, explain about the essential components of thermal power plant. [7M]
b) Discuss factors for selection of the site, merits and de-merits of a hydro-electric plant. [7M]
- (OR)
2. a) Describe working of Nuclear power plant with neat sketch? [7M]
b) Compare various power plants in detail? [7M]

UNIT-II

3. a) What are bundled conductors? What are ACSR conductors? Explain the advantages and disadvantages of both when used for over head lines. [7M]
b) Determine the sending end voltage, current power factor of a 1-phase 50 Hz, 76.2 kV transmission delivering a load of 12 MW at 0.8 pf . the line constants are $R = 25 \text{ ohms}$, inductance 200 mH and capacitance between lines $2.5 \mu\text{F}$. Also determine the regulation and η of transmission . Use nominal – π method. [7M]
- (OR)
4. a) Discuss about various connection schemes of distribution system. [7M]
b) Differentiate Overhead & Underground systems in six aspects? [7M]

UNIT-III

5. a) Explain SF6 circuit breaker and vacuum circuit breaker with neat sketch? [7M]
b) Suppose, the actual fault current in case of a severe line to ground fault is 3000A. Assuming the CT ratio to be 100/1, calculate the time of operation of an inverse definite minimum time (IDMT) relay for the above fault, if the plug-setting is 50%, and the time-multiplier setting is 0.2. [7M]
- (OR)
6. a) Explain the following terminologies used in protective relaying: (i) Relay time and Breaker time.(ii) Pick up and pickup relay (iii) Fault clearing Time (iv) Time delay [7M]
b) Explain methods of Resistance ,Reactance and Resonant Grounding? [7M]

UNIT-IV

7. a) Define i) fixed-cost ii) running cost iii) Tariff iv) demand factor v) utilization factor [7M]
- b) A factory has the following data: Total connected load=150kW. Installed capacity 2000kW. The plant operates for 30 days, 24 hours each day. Maximum demand recorded during this period = 1200 Kw. Total energy consumed during the period = 720,000 kWh. Calculate the Average Load over the period. Load Factor, Demand Factor, Utilization Factor. If the maximum demand is reduced by 10% through load management, calculate the new Load Factor [7M]

(OR)

8. a) Define the following terms i) Connected load ii) maximum demand iii) demand factor iv) load factor v) Diversity factor vi) load duration curve. [6M]
- b) The annual working cost of a power station is represented by the formula $Rs(a+bkw+ckwh)$ where the various terms have their usual meaning. Determine the values of a, b and c for a 60 MW station operating at annual load factor of 50% from data: (i) Capital cost of building and equipment is Rs 5 X 10⁶ (ii) the annual cost fuel, oil, taxation and wages of operating staff is Rs 9,00,000. (iii) The interest and depreciation on building and equipment are 10% per annum (iv) Annual cost of organization and interest on cost of site etc. is Rs 5,00,000. [8M]

UNIT-V

9. a) Explain various methods to improve power factor in detail? [7M]
- b) A factory has a load of 120 kW operating at a power factor of 0.8 lagging. Calculate: [7M]
- i) The apparent power (kVA) ii) The reactive power (kVAR)
- iii) How much kVAR is required to improve the power factor to 0.91?

(OR)

10. a) Draw and explain different types of voltage control Devices [7M]
- b) A 120 kVA, 11 kV/400 V transformer has an impedance voltage of 6% at full load. Calculate: [7M]
- i) The voltage regulation at full load when the power factor is 0.7 lagging.
- ii) The voltage regulation at full load when the power factor is 0.6 leading
