

II B.Tech II Semester Regular Examinations, Apr/May 2008

POWER SYSTEMS-I

(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Draw a typical layout of a thermal power plant and describe the function of the following components.
 - (a) Coal and ash handling
 - (b) steam generating plant
 - (c) steam turbines
 - (d) feed water circuit
 - (e) Cooling tower circuit. [3+3+4+3+3]

2. (a) What is the need of nuclear power generation?
 (b) What are the merits and demerits of nuclear power plant? [6+10]

3. (a) What is meant by radial and loop systems of distribution.
 (b) On what factors does the primary distribution voltage depend.
 (c) A two wire distributors are fed at F_1 and F_2 at 230 V and 220 V respectively. Loads of 150 A and 100 A are taken at points P and Q. Resistance of both the conductors between F_1P is 0.03Ω , between PQ is 0.05Ω and between QF_2 is 0.02Ω . Determine the current in each section of the distributor and voltage at each load point. [4+6+6]

4. A single phase line (ABC) of length 2 Km having resistance and reactance (go and return) as 0.06 and 0.1 ohms / Km. A is the feeding point, B is the mid point of the line taking a load of 100A at 0.9 p.f. leads and C is the far end taking a load of 120 A at UPF. The voltage at the 'C' is 230V. Find the voltage at the sending end and the phase angle difference between the voltages of two ends. If
 - (a) power factors of the loads are with reference to far end voltage
 - (b) Power factors of the loads are with reference to the voltages at the load points. [8+8]

5. (a) What are the factors to be considered for selecting location of substations?
 (b) What are the merits and demerits of indoor substations over outdoor substations? [8+8]

6. (a) What factors determine the economical limit of p.f. correction? Show that the economical limit to which the p.f. of a lagging p.f. load can be raised is independent of the original value of the p.f. if the tariff consists of a fixed charge per KVA of maximum demand plus a flat rate per KWh.

- (b) Calculate the value of the new p.f. when the tariff is Rs. 1,350 per KVA of maximum demand plus a flat rate paise 80 per kWh. Assume additional cost of condensers etc. at Rs. 1,050 per KVA of such plant. Rate of interest and depreciation together is taken as 10%. [8+8]
7. (a) Explain clearly how a good load factor and a good diversity factor help to keep overall cost of generation low.
- (b) The peak load on a 50MW power station is 39 MW. It supplies power through for transformers whose connected loads are 17, 12, 9 and 10 MW. The maximum demands on these transformers are 15, 10 8 and 9 MW respectively. If the annual load factor is 50% and the plant is operating for 65% of the period in the year, find out
- average load on the station
 - energy supplied per year
 - demand factor
 - diversity factor and
 - use factor for the power station. [8+8]
8. (a) Describe the desirable characteristics of a tariff.
- (b) A steam station with an installed capacity of 120 MW has the following data:
Maximum demand = 100 MW; Average Load factor = 0.75
Capital cost = Rs. 800/ kW installed
Interest and depreciation = 12%
Operational cost = Rs. 1×10^6 per annum.
Maintenance cost ($\frac{2}{5}$ fixed, $\frac{3}{5}$ variable) = Rs. 6.5×10^5 p.a.
Cost of fuel = Rs. 35 per metric ton
Calorific value of fuel = 6,500 K. cal / kg
Generator efficiency = 96% Thermal efficiency of turbine = 28% Boiler efficiency = 75% Overall thermal efficiency = 20%
Determine the total fixed costs, total variable costs and the cost / kW generated. [8+8]
