Exam.Code:0937
Sub. Code: 6995

1129

B.E. (Electrical and Electronics Engineering)

Seventh Semester

EE-709: Electric Power Generation

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

1. (i) What is group diversity factor? How it helps in power system operation?
   (ii) What is incremental water rate in hydro-thermal coordination?
   (iii) In which type of tariff plan, the penalty is imposed for low power factor?
   (iv) What information no spill curve of a reservoir of a hydro plant conveys?
   (v) What is pumped storage power plant?

(2*5=10)

PART-A

2. (i) An electrical system experiences linear changes in load such that its load curve is defined as follows:

Time	12PM	3AM	5AM	8AM	2PM	4PM	6:30PM	8:30PM	10PM	12PM
Load (MW)	20	30	30	50	70	65	70	80	70	20

Plot load duration, energy generated in 24 hours, energy curve, mass curve and load factor, utilization factor of the plant serving this load if its capacity is 180 MW.

(ii) Draw single line diagram of nuclear power plant. Explain role of major components of nuclear power plant.

(7,3)

3. (i) Define connected load, demand factor and load factor. What is their importance?

(ii) A 500 V, 3-phase 50 Hz circuit takes 20 A at power factor of 0.8 lagging. It is desired to improve the power factor to unity by using synchronous motor. The synchronous motor will derive a mechanical load of 10 H.P. The efficiency of motor is 0.8. Find the KVA drawn by the motor and its power factor. (3,7)

4.(i) What are the causes of power crisis in Indian power sector?

(ii) A central station supplies energy to two sub stations, 4 feeders take off from each of the substations. The maximum demands are as under:

Central stations 10 MW; Substation A is 6 MW; Substation B is 8 MW; Feeders on substation A has 1.5 MW, 2 MW, 5 MW and 3 MW; Feeders on substation B has 2 MW, 4 MW, 5 MW and 1 MW. Calculate the diversity factor between substations, feeders on substation A and substation

B (4,6)

PART-B

5. (i) Discuss the costs involved in capital and annual fixed cost of power plant installation.

(ii) The daily load curve data for a certain area is as under

Time	12AM-2AM	2-5	5-8	8-12 (noon)	12-5 PM	5-8	8 PM-12AM
Load (MW)	20	40	60	55	40	30	20

It is proposed to install a run off river plant and a steam plant for supplying the above load. The run off data indicates that a flow of 70 m^3/sec is available for 97% of time during the year. The head is 80 m, hydro plant efficiency 80% and transmission losses 7%. Determine the capacity of hydro and steam plant. Suggest a schedule of plant output.

(4,6)

6. (i) What are advantages of hydro-thermal coordination? Write co-ordination equations for the same.

(ii) Compute the generation cost per kWh from the following data:

Installed capacity-300 MW
Reserve capacity-50 MW
Capital cost-Rs 4500000/kW
Interest and depreciation-8%
Fuel consumption -0.8 kg/kWh
Fuel cost-Rs 1230 per 1000 g
Other operating cost-30% of fuel cost
Peak load -170 MW
Load factor-80%

(4 ,6)

7.(i) What are the various spinning reserves? How they contribute in power system economics?

(ii) The annual electricity requirements of an industry are 20,000 MWh with a maximum demand of 30 MW. The requirements can be met from a utility charging Rs 800 per kW of maximum demand plus Rs 4/Kwh. Alternatively the industry can be set up a private steam plant which will have a capacity of 70 Mw. The various costs involved are as given below:

	Plan A	Plan B	Plan C
Total capital costs of plant (Rs/kW)	18000	16000	14000
Station heat rate	5000	3500	5500

Interest rate 8%, insurance rate 0.6%, taxes 3%, depreciation rate can be calculated using sinking fund method, while life of plant is 25 years. Heat value of coal is 5000 k cal/kg, fuel cost is Rs 1200 per 1000 kg, salaries, supplies and maintenance Rs $65*10^6$ per year. Compare the various plans using rate of return. Select the optimum plan. (3,7)

x-x-x