Exam.Code:0937
Sub. Code: 6639

2122

**B.E. (Electrical and Electronics Engineering)**
**Seventh Semester**
**EE-709: Electrical 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. Missing data (if any) can be appropriately assumed.*

*x-x-x*

**Q1 A)** Draw labeled single line diagram representation of a nuclear power plant. **(2)**

**B)** Two part tariff is used for industrial consumers and not for residential consumers. Why? **(2)**

**C)** Discuss the role of load factor on the cost of electrical energy. **(2)**

**D)** Discuss why? Even if the maximum demand and load factors of two systems are equal, their load duration curves may not be similar. **(2)**

**E)** What are the different factors to be considered while selecting the site for hydro electric power plants? **(2)**

## Part A

**Q2 A)** Explain with sketch the general layout of hydro electric power plant. Also list out any four factors to be considered for selection of site of thermal (steam) power Plant. **(5)**

**B)** What do you understand by tarriff? Discuss the objective of the tariff. Also explain the different types of tariffs used for domestic and commercial loads. **(5)**

**Q3 A)** The peak load on a 50 MW power station is 40 MW. It supplies power through four transformers whose connected loads are 19, 11, 9, 10 MW. The maximum demands on these transformers are 16, 9, 8, 9 MW respectively. If the annual load factor is 55% and the plant is operating for 70% of tee period in a year, find the following: **(5)**
(i) Average load on the station (ii) Energy supplied per year
(iii) Demand Factor, (iv) Diversity Factor
(v) Power station use factor.

**B)** A generating station has a maximum demand of 75 MW and a yearly load factor of 40%. Generating inclusive of station capactal costs are Rs. 60 per annum per kW demand plus 4 paise per kWh transmitted. The annual capital charges for transmission syystem are Rs 20,00,000 and for distribution system Rs. 15,00,000; the respective diversity factors being 1.2 and 1.25. the efficiency of transmission system is 90% and thet of the distribution system inclusive of substation losses is 85%. Find the yearly cost per kW demand and cost per kWh supplied: (i) at the substation (ii) at the consumers permises. **(5)**

**Q4 A)** State the causes and effects of a poor power factor and derive an expression for most economical power factor when kVA demand is kept constant **(5)**

**B)** A 3-phase, 50 Hz, 400 V moto develops 100 H.P. (74.6kW) thhe power factor being 0.75 lagging and efficiency 93 %. A bank of capacitors is connected in delta across the supply terminals and power factor raised to 0.95 lagging. Each of the capacitance units is buuilt of 4 similar 100 V capacitors. Determine the capacitance of each capacitor. **(5)**

P.T.O.

## Part B

**Q5** The annual electricity requirements of an industry are 20000MWh with a maximum demand of 50MW. The requirements can be met from a utility charging Rs 800 Per kW of maximum demand plus 150 paisa per kWh. Alternatively the industry can set up a private steam plant which will have a capacity of 60 MW. The following different plans for setting up the steam plant are available. **(10)**

| | Plan A | Plan B | Plan C |
|---|---|---|---|
| Total capital costs of plant | Rs 19500 Per kW | RS 20000 Per kW | Rs 21000 Per kW |
| Station heat rate k-cal/kWh | 3500 | 3000 | 2600 |

Taxes 4%, insurance 0.5% interest rate 8%. Depreciation rate may be calculated by sinking fund method taking plant life as 0 years. Heat value of coal 5000 k cal/kg fuel cost Rs 1400 per 1000Kg, annual salaries, supplies and maintenance Rs 620000 per year. Compare the different plans by

(i) Present worth method.

(ii) Capitalized cost method.

Select the optimum plan using each of the two methods.

**Q6 A)** Explain the procedure to be followed to select the plant for a location in detail. **(5)**

**B)** A 300 kVA distribution transformer costs Rs.20000 & has a salvage value of Rs.1000 at the end of 20 Years. Determine the depreciated value of the power plant at the end of ten years on the following methods of assessment. **(5)**

i) Straight line depreciation.

ii) Sinking fund depreciation of 8% compounded annually.

**Q7 A)** Hydro-plant and steam-plant are operating together to fulfill the system load requirement. The steam-plant is located near the load center whereas the hydro-power - plant located at a remote location. The system load is 800 MW for 18 hrs a day and 350 MW for remaining 6 Hrs of a day. **(5)**

The characteristics of the hydro and steam units are

$C_1 = 125 + 50\ P_{GT} + 0.095\ P^2_{GT}$ Rs/hr

$w_2 = 0.68\ P_{GH} + 0.00283\ P^2_{GH}$ $m^3/s$

Loss coefficient $B_{22} = 0.00125\ MW^{-1}$

Find the generation scheduling, daily water used by hydro plant and daily operating cost of thermal plant for $\gamma_j = 85.05$ *Rs./$m^3$-hr.*

**B)** Derive the co-ordination equation for the optimal scheduling of Hydro – Thermal interconnected power systems. **(5)**

*x-x-x*