Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – WINTER 2012

Subject code: 732103 **Date: 26/12/2012**

Subject Name: Economics and Management of Thermal Systems

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain role of fuels in the power plant economics? **07**

(b) Explain the method of determining the distribution of the given load among the two plants for most economic generation **07**

Q.2 **(a)** Mention the advantages and disadvantages of hydro-electric power plant compared to thermal power plant. **07**

Why combined operation of hydro and thermal plants is more economical than individual operation of the plant?

(b) The following loads are connected to a power plant: **07**

(i) Domestic load with 15MW maximum demand, 1.25 diversity factor and 0.70 demand factor

(ii) Commercial load with 25MW maximum demand, 1.20 diversity factor and 0.90 demand factor

(iii) Industrial load with 50MW maximum demand, 1.30 diversity factor and 0.98 demand factor

If the overall diversity factor is 1.5, determine

(I) the maximum demand and

(II) Connected load of each type.

OR

(b) Discuss clearly the advantages and disadvantages of air storage systems **07**

Q.3 **(a)** Explain with diagram the pump storage plant and show that the energy developed by water turbine during peak requires nearly 1.4 kWh energy to that supplied to the pump during off-peak period. **07**

(Assume efficiencies for pump and turbine).

(b) For the above derivation, also give economic justification of pump storage plant **07**

OR

Q.3 **(a)** What do you understand by peak load plant? What is the basic requirement of a peak load plant? **07**

(b) From the following data, estimate the generating cost in paise/kWh delivered by the power station: **07**

Installed capacity is 142.5 MW, annual load factor is 60%, capacity factor is 50%, capital cost of plant is Rs. 130 x 10^7, annual cost of coal, oil, tax and salaries is Rs. 18.8 x 10^7, rate of interest is 5% of capital, rate of depreciation is 5% of capital, units of energy used to run the plant auxiliary is 6% of the total unit supplied.

What is the reserve available?

Q.4 **(a)** Discuss the effect of variable load on power plant design and operation **07**

(b) The cost of water softener plant used is Rs. 120000 when newly installed. The life of the plant is considered as 12 years. The salvage value of the plant will **07**

be 8% of its cost when newly installed. The repair, maintenance and labour costs of the plant per year are Rs. 8000. The cost of chemical used per year is Rs. 5000. Find the annual cost of the plant. Take interest on sinking fund as 8%.

OR

Q.4 **(a)** Define: (i) average load (ii) peak load (iii) load factor (iv) use factor (v) capacity factor (vi) demand factor (vii) diversity factor **07**

Q.4 **(b)** Discuss and draw load consumption pattern curves of domestic sector, agricultural sector and industrial sector. **07**

Q.5 **(a)** Explain in the context of Indian scenario, the role of power in development of country. **07**

(b) Discuss clearly the points in favour of Combined operation of Power Plant. **07**

OR

Q.5 **(a)** What are non-conventional sources of power generation? Discuss its scope in India **07**

(b) A new housing development is to be added to the lines of public utility. There are 1000 apartments, each having a connected load of 5kW the services as given below in the table are also to be included in that development. **07**

Type of service	No.	Connected load of Each in kW	Demand Factor
Laundry	2	20	0.68
Temples	2	10	0.56
Restaurant	2	60	0.54
Book Store	1	5	0.68
General Store	4	8	0.75
Drug Store	2	10	0.82
Shoe Store	1	2	0.71
Cloth Store	2	5	0.55
Theatre	2	120	0.60
Saloon	2	4	0.72
Flour Mill	2	7	0.65
Vegetable Market	1	5	0.88

The demand factor of the apartments is 40%. The group diversity factor of the residential system is 3.2 and peak diversity factor is 1.5. The diversity of the commercial group load is 1.6 and peak diversity factor is 1.2.

Find the increase in peak demand resulting from addition of this housing development on the distribution system. Assume line losses as 5% of delivered energy.

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