

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – III • EXAMINATION – WINTER • 2014****Subject code: 732103****Date: 27-11-2014****Subject Name: Economics and Management of Thermal Systems****Time: 02:30 pm - 05:00 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) In Indian Power Scenario, percentage power generated by thermal power plant is highest in India. Discuss the features of thermal power plant with respect to this statement. **07**
- (b) What is load curve? Discuss and draw different load curves with example in each case. **07**

- Q.2** (a) Compare coal and nuclear as fuel to discuss various features of fuel in power plant economics. **07**
- (b) What are the special events which affect the variation in load curve for different requirements? **07**

OR

- (b) Define with example: connected load, maximum demand, demand factor, average load, load factor, diversity factor, and plant capacity factor. **07**
- Q.3** (a) Prove that heat rate (HR) of continuous input-output curve is minimum when it equals the incremental rate (IR) when two curves (HR v/s load and IR v/s load) cross at load L_m when $IR_m = HR_m$. **07**
- (b) The load connected to power plant are as below: **07**
- i) Domestic load has maximum demand of 15 MW with diversity factor 1.25 and demand factor of 0.70.
 - ii) Industrial load has maximum demand of 50 MW with diversity factor 1.30 and demand factor of 0.98.
 - iii) Commercial load has maximum demand of 25 MW with diversity factor 1.20 and demand factor of 0.90.
- If overall diversity factor is 1.5, determine (a) the maximum demand and (b) connected load of each type.

OR

- Q.3** (a) Show that per kW-hr energy developed by water turbine during the peak requires nearly 1.4 kW-hr energy to be supplied to the pump during off-peak period. Is it economically justifiable to develop power with such scheme? Justify. **07**
- (b) A small plant capital cost is Rs. 40000 and its salvage value is Rs. 4000 at the end of useful life of 20 years. Find its value half way through its life based on **07**
- (i) Straight line depreciation method
 - (ii) Reducing balance depreciation method
 - (iii) Sinking fund depreciation at 6% compounded annually.

- Q.4** (a) Discuss storage type hydro-electric plant in combination with steam plant **07**
- (b) Discuss the different arrangements of equipment of air storage plants. **07**

OR

- Q.4** (a) Write short note on air reservoirs. **07**

- (b) The estimated costs of two power stations I and II running parallel are Rs. $(2500\text{kW} + 0.550\text{kWh})$ and Rs. $(2400\text{kW} + 0.6 \text{ kWh})$ respectively and supply to a system whose maximum load is 100 MW and minimum load is 10MW during the year. The load varies as straight line. (Figure 1) **07**

Find for minimum cost of generation:

- Installed capacity of each station.
- The annual load, capacity and capacity use factor of each station.
- The average cost of production per kWh for entire system. Assume reserve capacity of II is 20%.

- Q.5** (a) Explain how steam power stations can be used peak load plants? **07**
 (b) Define: fixed cost of electrical energy, depreciation cost, fuel cost, operating cost, management cost, material cost and payback period. **07**

OR

- Q.5** (a) Compare pump storage systems with air storage systems. **07**
 (b) Write short note on the method of deciding the size and number of generating equipment to fit optimally the load curve. **07**

Q4 (b) OR- (Figure 1)


