

QP Code : 30000

(3 Hours)

Total Marks :100

- Question No 1 is compulsory.
- Answer any four out of remaining six questions.
- Assumptions made should be clearly stated .
- Assume suitable data wherever required, but justify the same.

1 Write short notes on any four of the following :

- Load management of power plant.
- Moderators in nuclear power plant.
- Advantages of fluidized bed combustion.
- Surge tank
- Benefits of cogeneration
- Water hammer and its remedial measures.

2 a) Prove that the condition for economic loading of different units for a power plant [10]

$$\text{site is } dI_1/dL_1 = dI_2/dL_2 = dI_3/dL_3 = \dots = dI_n/dL_n$$

A power station supplies the following loads to the consumers: [10]

b)

Time in Hrs	0-6	6-10	10-12	12-16	16-20	20-22	22-24
Load (MW)	30	70	90	60	100	80	60

Draw the load curve and load duration curve and estimate the load factor

3 a) Explain with a neat sketch the operation of CANDU Reactor [10]

b) A generating unit of 10 MW capacity supplies the following loads : [10]

- Domestic consumers with a maximum demand of 6 MW at a load factor of 20%.
 - Small industrial load with a maximum demand of 3.6 MW at a load factor of 50%.
 - Street light load with a maximum demand of 400 kW at 30% load factor.
- Find the overall cost of energy per kWh for each type of consumer using the data below :

Initial investment : Rs 10000 per kW; Total running cost : Rs 36,00,000 per year
Annual rate of interest together with depreciation on capital cost is 10%

[TURN OVER]

- 4 a) Explain in brief the factors to be considered for location of coal based thermal power plant. [10]
- b) A gas turbine plant operates with a pressure ratio of 5. The inlet temperature of the air to the compressor is 300K and pressure is 1 bar. The isentropic efficiencies of compressor and turbine are 80% and 85 % respectively. The heat added to the cycle amounts to 500 kJ/kg. If the overall efficiency of the cycle with regenerator is to be 30% , determine the effectiveness of the regenerator. [10]

Assume $\gamma = 1.4$ and $C_p = 1.05$ kJ / kg K throughout the cycle.

- 5 a) What are the advantages of pulverised coal firing. Draw the layout of direct pulverised coal firing plant and explain its working. [8]
- b) Following observations were made during a trial on single cylinder four stroke diesel engine. Fuel Consumption = 8.8 kg/hr, C.V of fuel 43890kJ/kg, m.e.p = 5.8 bar, Bore = 300 mm, Stroke = 450 mm, Speed = 200 RPM, Diameter of Brake Wheel = 1.22 m, Brake Load = 1860 N, Water circulated = 650 kg/hr Temperature Rise of water = 22°C, Calculate : (i) Mech Efficiency, (ii) Brake Specific Fuel Consumption. (iii) Brake Thermal efficiency, (iv) Heat carried away by cooling water. [12]
- 6 a) Draw the layout of a pumped storage plant and explain its working. [10]
- b) Discuss with T-s diagrams the effect of reheating and regeneration in steam based power plant. [10]
- 7 Write notes on any **four** of the following : [20]
- (i) Cooling system for diesel power plant.
 - (ii) Measurement of rainfall.
 - (iii) Radioactive decay
 - (iv) Flue gas desulphurisation.
 - (v) Flow duration curve.