

**QP Code : 2466**

**(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 : [20]

- (a) Economic loading of power plant
- (b) Causes and effects of acid rain
- (c) Benefits of cogeneration
- (d) Mechanical Dust collector.
- (e) Desulphurisation of flue gases.

2 a) (i) Write a note on current power scenario in Mumbai [5]

(ii) Explain in brief types of power tariff. [5]

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

i) Draw the load curve and estimate the load factor of the plant. ii) What is the load factor of a standby equipment of 30 MW capacity if it takes up all loads above 70 MW. What is its use factor?

3 a) Explain with a neat sketch the operation of Boiling Water Reactor (BWR). [10]

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

(i) Domestic consumers with a maximum demand of 6 MW at a load factor of 20%. (ii) Small industrial load with a maximum demand of 3.6 MW at a load factor of 50%. (iii) Street light load with a maximum demand of 400 kW at a load factor of 30%.

The capital cost of the plant is Rs10000/kW and the total running cost is Rs 36,00,000 lac per year. Annual rate of interest and depreciation on capital cost is 10%. Find the overall cost of energy per kWh for each type of consumer

**[TURN OVER**

**QP-Con. 12330-15.**

- 4 a) Explain in brief the effect of inter cooling, reheating and regeneration on the performance of Gas Turbine Power plant. [8]
- b) At the design speed the following data apply to a gas turbine set employing the regenerator : Isentropic efficiency of compressor = 75%, ii) isentropic efficiency of the turbine = 85%, iii) combustion efficiency = 98 iv ) mass flow = 200 kg/s, v) pressure ratio=6:1, regenerator effectiveness = 75%, vi) maximum cycle temperature = 1000K. The ambient air temperature and pressure are 15°C and 1.013 bar respectively. Calculate : (i) The net power output (ii) Specific fuel consumption (iii) Thermal efficiency of the cycle. Take the calorific value of fuel as 43125 kJ/kg and assume no pressure-loss in regenerator and combustion chamber. Assume  $c_p = 1.005 \text{ kJ/kgK}$  and  $\gamma = 1.4$  throughout the cycle. [12]
- 5 a) Explain in brief the various parameters to be considered for selection of site for hydel power plant. [8]
- b) Following observations were made during a trial on single cylinder 2 stroke diesel engine. : [12]
- Cylinder Diameter = 210 mm ; Stroke Length = 290 mm ; Speed = 360 RPM ; Net brake load = 680 N ; Effective Brake diameter = 1 m ; m.e.p = 3 bar ; Fuel used = 1.56 kg in 20 minutes ; Calorific value of fuel = 44000 kJ/kg ; Cooling Water circulated = 160 kg in 20 min ; Air fuel ratio = 30:1 ; Exhaust gas temperature = 310 ° C ; Ambient temperature = 27 ° C ; Rise in cooling water temperature = 25 ° C ; Steam formed per kg of fuel in the exhaust = 1.3kg ; Specific heat of steam in exhaust = 2.093kJ/kg K ; Specific Heat of dry exhaust gases = 1.01kJ/kgK ; Latent heat of steam = 2257.9kJ/kg.
- Calculate : i) Mechanical efficiency ii) Brake thermal efficiency and iii) Draw up heat balance sheet on second basis.
- 6 a) What are advantages of Fluidised Bed Combustion. Explain with a neat sketch the operation of Atmospheric Fluidised Bed Boiler. [10]
- b) Explain in brief the methods of radioactive waste disposal [10]
- 7 a) What are the different subsystems of a diesel power plant. Explain with a neat sketch the layout of a diesel power plant, [10]
- b) Write notes on the following : [10]
- (i) Cooling system for diesel power plant.
- (ii) Measurement of rainfall.

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