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BE-MECH / sem VII / PPE - 15/12/2014

QP Code : 15578

(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.

- Q-1 Write short notes on any four of the following : [20]
- (a) Load management of power plant.
 - (b) Benefits of cogeneration
 - (c) Mechanical dust collectors
 - (d) Surge tank
 - (e) Cooling system for diesel power plant.
 - (f) Water hammer and its remedial measures.
- Q-2 a) (a) Prove that the condition for economic loading of different units for a power plant site is $dI_1/dL_1 = dI_2/dL_2 = dI_3/dL_3 = \dots = dI_n/dL_n$ [10]
- b) A 300 MW thermal power plant is to supply power to a system having maximum and minimum demand of 240 MW and 180 MW respectively in a year. Assuming the load duration curve to be a straight line estimate the Load Factor and Capacity Factor of the plant. [10]
- Q-3 a) Explain with a neat sketch the operation of Pressurised Water Reactor. [10]
- b) Calculate the cost of generation per kWh for a power station having the following data: [10]
- i) Installed capacity of the plant = 210 MW
 - ii) Capital Cost : Rs18000/kW
 - iii) Rate of interest and depreciation = 12%.
 - iv) Annual Load Factor = 60%
 - v) Annual Capacity Factor = 54 %
 - vi) Annual Running Charges = Rs 200 x 10⁶
 - vii) Energy Consumed by power plant auxiliaries = 6%. Calculate the cost of power generation per kWh and the reserve capacity.
- Q-4 a) In a regenerative gas turbine cycle the pressure ratio is 5. Air enters the compressor at 1 bar, 300K and leaves at 490 K. The maximum temperature in the cycle is 1000K. Calculate the cycle efficiency given that effectiveness of regenerator and isentropic efficiency of the turbine each is 80%. Assume $C_p = 1.005 \text{ kJ/kgK}$ and ratio of specific heats is 1.4 throughout the cycle. [10]

[Turn Over

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- b) The runoff data of a river at a particular site is tabulated below :

[10]

Month	Mean Discharge (Millions of m ³)	Month	Mean Discharge (Millions of m ³)
January	1500	July	3000
February	1200	August	3600
March	900	September	3000
April	600	October	2400
May	300	November	2100
June	2100	December	1800

(i) Draw the hydrograph and find the mean flow.

(ii) Draw the flow duration curve

(iii) Find the power developed if the head available is 90 m and the overall efficiency of generation is 86%. Assume each month of 30 days.

- Q-5 a) What are the performance characteristics of a coal based thermal power plant. Discuss in brief the factors to be considered for selection of site for locating the plant. [10]

- b) In a test on a single cylinder 4 stroke diesel engine with bore 400 mm and stroke 450 mm , the following observations were made : [10]

Duration of test = 1 hr; Fuel Consumption = 7.5 kg ; C.V.of fuel = 44500 kJ/kg
 Total revolutions=12000/hr; Mean effective Pressure = 4 Bar ;Net Brake load =1500N ; Brake drum diameter = 180 Cm ; Rope drum diameter = 3 cm ; Jacket Cooling Water = 600 kg ; Rise in cooling water temp = 42 ° C ;Total air consumption = 361 kg ; Exhaust gas temperature = 300° C ; Room temperature = 20°C ; Specific heat of exhaust gases = 1.01kJ/kg-K

Calculate : i) Mechanical efficiency ii) Indicated and Brake thermal efficiency
 iii) Draw up heat balance sheet on minute basis

- Q-6 a) What are advantages of Fluidised Bed Combustion. Explain with a neat sketch the operation of Circulating Fluidised Bed Boiler. [10]

- b) Discuss the effect of reheating and regeneration on the performance of Steam Power plant. [10]

- Q-7 a) List the advantages of a diesel power plant [4]

- b) Discuss in brief the disposal of radioactive waste. [6]

- c) Explain with a neat sketch any one type of Flue Gas Desulphurisation plant. [10]