Total No. of Questions : 12]

SEAT No. :

P1529

[Total No. of Pages :5

[4759] - 41
B.E. (Mechanical)
POWER PLANT ENGINEERING
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume Suitable data, if necessary.***

SECTION - I

Q1) a) Explain the factors considered for site the selection of a power station. **[6]**

b) Discuss the status of power generation by the nonconventional sources in India. What is the role of government in this sector? **[6]**

c) A power generating unit of 15MW capacity takes the following load **[6]**

i) Domestic consumers with maximum demand of 8MW at a load factor of 25%.

ii) Cottage industry demand of maximum load of 4MW with a load factor of 45%.

iii) Corporation with street light load with maximum demand of 1MW with 30% load factor.

What is the overall cost of energy per kWh for each type of customers? The capital cost of the plant is Rs 9000/kW and running cost is Rs 40,000,000 per year. Take annual interest rate and depreciation on capital cost as 12%.

OR

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Q2) a) What is carbon credit? Explain with suitable examples. **[6]**

b) Explain the principle of economic scheduling of power plants. **[6]**

c) Find the monthly bill and unit cost for a consumer using the Hopkinon demand rate with the following data. **[6]**

i) Maximum demand: 14kW

ii) Energy consumption per month: 2400kWh

iii) Demand rate: 0-6kW = Rs 200/kW

7-12kW = Rs 160/kW

6-18kW = Rs 140kW

iv) Energy rates: First 100kWh = Rs 2.0/kWh

101-500 kWh = Rs 1.6/kWh

501-2000kWh = Rs 1.2/kWh

Over 2000 kWh = Rs 1.0/kWh.

What is the lower possible bill for a month and the unit energy cost for the given energy consumption?

Q3) a) Explain the merits and demerits of pulverized coal firing. **[4]**

b) How cogeneration is achieved using back pressure turbines and pass out turbines? **[6]**

c) In a thermal power plant steam is condensed in a surface condenser at 14000 kg/hr and the leakage is 6 kg/hr. The vacuum near the suction pump is 69cm of Hg and the temperature is 35°C. The air and the condensate are removed by a wet air pump. Find the capacity and the dimensions of the pump if N = 120 rpm, L/D is 1.2 and the pump is single acting. Take barometric pressure as 760mm of Hg. **[6]**

OR

Q4) a) Explain processes of the coal beneficiation and coal desulphurization. **[6]**

b) What is a dry cooling tower? When it is recommended? What are the different types of dry cooling tower? **[4]**

c) In a cogeneration plant steam is generated at 50 bars and 500°C and expanded thro' an isentropic turbine to a condenser pressure of 0.05 bars. The heating load is supplied by extracting steam from turbine at 3 bar which is condensed in a process heater to saturated liquid at 3 bar and then pumped back to boiler. The power load on the sytem is 6MW and the heating load is 1.2MW. Show the process on TS diagram and find **[6]**

i) steam generation capacity of boiler in TPH

ii) heat transfer to water in the boiler in kW

iii) rate of cooling water flow across the condenser if the temperature rise of the water is 5°C. Neglect the pump work.

Q5) a) With a suitable diagram explain the schematic layout of a hydro power plant. **[5]**

b) Discuss the performance characteristics of a gas turbine power plant. **[5]**

c) Compare the steam, hydro and gas power plant on the basis of site, initial cost, fuel cost, maintenance cost, cooling water requirement. **[6]**

OR

Q6) a) Explain the following terms **[6]**

i) Hydrograph

ii) Spillways

iii) Surge tank

iv) Draft tubes

v) Pumped storage plant

vi) Specific speed.

b) What is free piston engine? Discuss the relative merits and demerits. **[4]**

c) In an open cycle gas turbine power plant compressor is driven by the high pressure turbine. Power is produced by low pressure turbine. The exhaust gases are passed through the regenerator. Using the following data determine the air flow rate for 2MW power produced and thermal efficiency of the plant. **[6]**

Data:

i) isentropic efficiency of compressor and turbines: 88%

ii) Compressor inlet conditions: 27°C and 1 bar

iii) Pressure ratio:7

iv) Regenerator effectiveness: 0.8

v) Maximum temperature in the cycle: 900°C

Assume air flow rate to be equal to the gas flow rate, specific heat for air and gases as 1.005 and 1.128kJ/kgK, γ for air and gases as 1.4 and 1.34 respectively.

SECTION - II

Q7) a) Draw a neat diagram of CANDU type of reactor and give it's advantages and disadvantages over other types of reactors. **[8]**

b) Draw a typical layout of Diesel Power Station and Explain. **[8]**

OR

Q8) a) What different Moderators are used in practice? What different properties make them as suitable Moderators? **[8]**

b) Why the starting of Diesel Plant is more difficult? What different methods are used for starting Diesel Engine? Which method is common and why? **[8]**

Q9) a) What is the function of bus bar? Draw different types of Bus bar arrangements and discuss the relative merits and Demerits. **[8]**

b) Explain single basin and double basin tidal power plant with neat diagrams. **[8]**

OR

Q10)a) What are different types of switch gear installations? Discuss their relative merits and demerits. **[8]**

b) Explain the working of a fuel cell and list out its advantages over other nonconventional systems of power generation. **[8]**

Q11)a) What are the different methods presently adopted in the world to reduce the harmful Greenhouse Effect? **[9]**

b) Explain the different methods adopted to control Nuclear Pollution. **[9]**

OR

Q12)a) Write short notes on the following points: **[9]**

i) Acid rain

ii) Thermal Pollution

iii) SMOG

b) What are different methods used to control SO_2 in the flue gases? Explain any two. **[9]**

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