Total No. of Questions :12]

SEAT No. :

P2671

[Total No. of Pages :4

[5154] - 41
B.E. (Mechanical)
POWER PLANT ENGINEERING
(2008 Pattern) (Semester - II) (402047)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION-I

Q1) a) Compare the steam, hydro, gas and diesel power plant on the basis of site, cost, reliability & life cycle. **[4]**

b) Define: **[4]**

i) Load Factor

ii) Demand Factor

iii) Capacity Factor

iv) Plant Use Factor

c) The load on a power plant with respect to time for 24 hours are as below:

Time Hours	0-6	6-8	8-12	12-14	14-18	18-22	22-24
Load (MW)	40	50	60	50	70	80	40

Draw the load curve. Find the load factor of the plant. If the loads above 60 MW are taken by a standby unit of 20 MW capacity, find the load factor and the use factor of the standby unit. **[8]**

OR

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Q2) a) Explain various tariff methods in detail. **[8]**

b) Determine the generating cost per unit of 80 MW power station with the following data: Capital cost = Rs. 160×10^7, annual cost of fuel = Rs. 32×10^6, annual load factor = 45%. Interest & depreciation = 10% of capital cost, annual wages and taxes = Rs. 36×10^6, Assume maximum demand equal to capacity of the power plant. **[8]**

Q3) a) Discuss in detail 'In plant handling of coal' in a Thermal Power plant. **[6]**

b) Discuss the principle of operation of overfeed and underfeed stokers with the help of simple diagrams. **[6]**

c) Calculate: **[6]**

i) vacuum efficiency,

ii) condenser efficiency,

iii) corrected vacuum against standard barometer reading of 76 cm of Hg.

Consider following data available related to a steam condenser. Cooling water amount 4900 kg/hr, Condenser vacuum = 68 cm of Hg, Barometer reading = 76.8 cm of Hg, Mean condenser temperature = 38^oC, condensate collected = 2300 kg/hr, rise in cooling water temperature = 19^oC. Cooling water inlet temperature is 8.5^oC.

OR

Q4) a) Write a note on Fluidized Bed Combustion. **[6]**

b) Explain the working of electrostatic precipitator with neat sketch. **[6]**

c) The steam at 90 bar and 480^oC is supplied to a steam turbine. The steam is reheated to it's original temperature by passing through a re-heater at 12 bar. The expansion after the reheating take place to condenser pressure of 0.07 bar. Find the efficiency of reheat cycle and work output if the flow of the steam is 1 kg/s. Neglect the pressure loss in the system and the assume the expansion through the turbine isentropic. Do not neglect the pump work. **[6]**

Q5) a) Derive an expression for maximum work in Brayton cycle and prove that

$$W_{max} = C_p \left(\sqrt{T_{max}} - \sqrt{T_{min}}\right)^2$$ **[8]**

b) Draw a typical schematic layout of Hydro-electric power plant and explain it in detail. **[8]**

OR

Q6) a) Describe governing of any one hydro turbine with neat sketch. **[8]**

b) In a gas turbine plant, air at 0.9 bar and 303 K is admitted to the compressor and compressed to 4.5 bar with an isentropic efficiency of 85%. Its temperature is raised further by using exhaust gases passing through a re-heater. The maximum temperature of the cycle is limited to 1000°C. The gas is then expanded to 1.1 bar with an isentropic efficiency of 80%. Find the thermal efficiency of the system assuming effectiveness of the re-heater as 0.8. Neglect the fuel mass and pressure losses. if the air flow is 5 kg/s, find the power developing capacity of the system. **[8]**

SECTION-II

Q7) a) Draw a neat sketch of CANDU type reactor. Explain it's working and state it's advantages and disadvantages. **[8]**

b) What are the advantages and disadvantages of diesel power plant? Which factors should be considered while selecting a site for a diesel power plant. **[8]**

OR

Q8) a) Explain the working of pressurised water reactor with neat sketch. **[8]**

b) Draw performance characteristic curves of diesel power plants. **[4]**

c) Discuss various losses in I.C. engines. **[4]**

Q9) a) Explain single basis and double basis tidal power plant with neat diagrams. **[6]**

b) State the advantages and disadvantages of fuel cell. **[6]**

c) Explain with the help of a neat diagram a solar pond electric power plant. **[6]**

OR

Q10) Write short notes on any three of following: **[18]**

a) Geothermal power plants.

b) Magneto hydro dynamic systems.

c) Necessity and methods of cooling of transformers.

d) Primary and secondary electrical distribution systems.

e) High temperature solar thermal power plants.

Q11) a) What do you mean by 'Thermal pollution'? What is 'Thermal Discharge Index' (TDI). **[8]**

b) Discuss the various methods in brief to control pollutants of power plants. **[8]**

OR

Q12) a) What is 'Particulate emission'? How it is controlled? **[8]**

b) Explain Pre & Post treatment for controlling oxides of sulphur. **[8]**

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