Reg. No. ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 51865

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Sixth/Seventh Semester

Mechanical Engineering

ME 2403/ME 73/ME 1353/10122 ME 704 – POWER PLANT ENGINEERING

(Regulations 2008/2010)

(Common to PTME 2403/10122 ME 704 – Power Plant Engineering for B.E. (Part-time)

Seventh Semester – Mechanical Engineering Regulations 2009/2010)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are supercritical boilers ?

2. Draw p-V and T-s diagram for binary cycle.

3. List the advantages of an economizer.

4. Write short notes on different types of Drafts.

5. What is meant by 'over feed' and 'under feed' principles of firing coal ?

6. Differentiate fission with fusion process.

7. Classify hydroelectric power plants.

8. Write any four applications of Diesel Plant.

9. What is the principle of operation of OTEC plant ?

10. The peak load on a power plant is 60 MW. The loads having maximum demands of 30 MW, 20 MW, 10 MW and 14 MW are connected to the power plant. Estimate diversity factor.

PART – B (5 × 16 = 80 Marks)

11. (a) A steam power plant, operating with one regenerative feed water heating runs at the initial steam conditions of 35.0 bar and 440 °C with exhaust pressure of 0.040 bar. Steam is bled from the turbine for feed water heating at a pressure of 1.226 bar. Determine :

    (i) Specific heat consumption

    (ii) Thermal efficiency of the cycle

    (iii) Economy percentage compared with the cycle of a simple condensing power plant.

OR

    (b) What is Fluidised Bed Combustion ? Sketch and describe a Fluidised Bed Combustion (FBC) system. State the advantages of FBC system.

12. (a) Explain with the help of neat sketch, the construction and working of steam power plant.

OR

    (b) With the help of neat diagrams, explain the working of surface condenser highlighting merits and limitations.

13. (a) Explain with the help of a neat sketch the working principle of pressurized water reactor.

OR

    (b) List and describe the factors mainly considered in selecting a prime-mover for (i) run-off river plant (ii) storage plant (iii) pump-storage plant.

14. (a) With a neat sketch, describe the working principle of Diesel plant. List its classifications ?

OR

(b) At the design speed, the following data apply to a gas turbine set employing a heat exchanger :

Isentropic efficiency of the compressor – 75 %, Isentropic efficiency of the turbine – 85 %, Combustion efficiency – 98 %, Mass flow – 22.7 kg/sec, Pressure ratio – 6:1, Heat exchanger effectiveness – 75 %, Maximum cycle temperature – 1000 K.

The ambient air temperature and pressure are 15 °C and 1.013 bar respectively. By assuming no pressure-loss in heat exchanger and combustion chamber, calculate the net power output and thermal efficiency of the cycle. Take the lower calorific value of the fuel as 43125 kJ/kg. Take C_p = 1.005 kJ/kg K and γ = 1.4 during compression. C_p = 1.147 kJ/kg K and γ = 1.33 during heating and expansion.

15. (a) (i) Describe the wind power generation with neat sketch. **(8)**

(ii) Explain the construction and working of Geothermal plant. **(8)**

OR

(b) The annual peak load on a 30 MW power station is 25 MW. The power station supplies load having maximum demands of 10 MW, 8.5 MW, 5 kW and 4.5 MW. The annual load factor is 0.45. Find :

(i) Average load

(ii) Energy supplied per year

(iii) Diversity factor

(iv) Demand factor.

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