Code: 13A03804 **R13**

B.Tech IV Year II Semester (R13) Advanced Supplementary Examinations July 2017

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) What is the significance of load curves?

(b) List the factors which should be considered while designing a power plant.

(c) What are the types of fluidized bed boilers?

(d) State the characteristics of a good ash handling plant.

(e) List the advantages of diesel power plant.

(f) Give the advantages of "combined cycle power plants".

(g) What is a surge tank?

(h) What are the functions of a draft tube?

(i) What is a photovoltaic cell?

(j) List the advantages of open cycle MHD system.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 An electric supply has the following data:

Power generated = 500 x 10^6 kWh

Maximum demand = 150 x 10^3 kW

Cost of generation = Rs 32 x 10^5

Cost of transmission line = Rs 650 x 10^4

Cost of distribution line = Rs 280 x 10^4

Cost of fuel = Rs 550 x 10^4.

Out of these 10% and 8%, 6% and 90% are running charges and remaining is fixed charge. The transmission and distribution loss is 10%.

(i) Calculate two part tariff.

(ii) If the load factor of the plant is raised to 55% for same maximum demand, calculate the percentage saving in overall cost per kWh.

OR

3 It is proposed to supply a load with a maximum demand of 100 MW and a load factor of 0.4. Choice is to be made from nuclear, hydro and steam power plants. Calculate the overall cost per kWh in each scheme.

Cost	Nuclear power plant	Hydro power plant	Steam power plant
Capital / kW installed	Rs. 600	Rs. 4320	Rs. 2160
Interest	10%	10%	12%
Depreciation	10%	8%	12%
Operating cost / kWh	12 paise	6 paise	18 paise
Transmission and distribution cost per kWh	0.24 paise	0.96 paise	0.24 paise

Contd. in page 2

UNIT – II

4 In a steam power plant, operating on the ideal Rankine cycle, the steam enters the turbine at 5 MPa and 450°C and is condensed in the condenser at 15 kPa. Determine:
(i) The thermal efficiency of the power plant.
(ii) The thermal efficiency if the boiler pressure is raised to 10 MPa while the turbine inlet temperature is kept constant at 450°C.

OR

5 Explain about fluidized bed boiler with neat sketch.

UNIT – III

6 The gas turbine has an overall pressure ratio of 5 : 1 and a maximum cycle temperature of 550°C. The turbine drives the compressor and an electric generator, the mechanical efficiency of the drive being 97%. The ambient temperature is 20°C and the isentropic efficiencies of the compressor and turbine are 0.8 and 0.83 respectively. Calculate the power output in kilowatts for an air flow of 15 kg/s. Calculate also the thermal efficiency and the work ratio. Neglect changes in kinetic energy and the loss of pressure in combustion chamber.

OR

7 A two cylinder C.I engine with a compression ratio 13:1 and cylinder dimensions of 200 mm x 250 mm works on two stroke cycle and consumes 14 kg/hr of fuel while running at 300 r.p.m. The relative and mechanical efficiencies of engine are 65% and 76%.The fuel injection is affected up to 5% of stroke. If the calorific value of fuel used is 41800 kJ/kg, calculate the mean effective pressure developed.

UNIT – IV

8 Explain with neat sketch the different types of spillways.

OR

9 Explain underground hydro power plant and list out the advantages and disadvantages.

UNIT – V

10 Explain the horizontal axis wind mill turbine with all components and list out the advantages and disadvantages.

OR

11 Explain with neat sketch Magneto hydrodynamics system.

*****