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R15

B.Tech IV Year II Semester (R15) Regular Examinations April 2019

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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

(a) Explain nuclear fission.
(b) Give a note on pollutants of power plants.
(c) Explain coal handling equipment.
(d) List the important parameters for selection of site for a steam power plant.
(e) Sketch proper P-v and T-s diagrams for a diesel engine.
(f) Sketch proper T-s diagram for a two stage gas turbine power plant with intercooling.
(g) Define spill ways.
(h) Define catchment area.
(i) What are the different methods of harnessing solar energy?
(j) What is heavy water? Explain.

PART – B

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

UNIT – I

2 (a) Define load factor and capacity factor.

(b) A power plant of 210 MW installed capacity has the following particulars:

Capital cost – Rs. 18,000 / kW installed
Interest and depreciation - 12%
Annual load factor - 60%
Annual capacity factor - 54%
Annual running charges - Rs 200 x 10^5
Energy consumed by power plant auxiliaries - 6%.

Calculate: (i) The cost of power production per kWh. (ii) The reserve capacity.

OR

3 (a) Explain the significance of combined power cycles.

(b) With a proper sketch, explain how MHD technique is used in power generation.

UNIT – II

4 (a) List the different types of mechanical stokers and explain any one of them with proper sketch.

(b) What is pulverization? How does it help in burning of coal?

OR

5 (a) Explain steam power plant with neat diagram.

(b) Write a note on pollution from thermal power plants.

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UNIT – III

6 (a) Explain combustion chamber of an open cycle gas turbine plants.

(b) List the different areas of application of diesel engines in power production. Also list the advantages of a diesel power plant.

OR

7 (a) Give layout of a low capacity diesel power plant and explain its function.

(b) A gas turbine takes in air at 101 kN/m^2 and 15°C. The air is compressed to a pressure of 606 kN/m^2 and then passed through a regenerative heat exchanger of effectiveness 0.65. The air is then passed through the combustion chamber where the temperature is increased to 870°C by the combustion of fuel. The gases enter the turbine and are expanded to 101 kN/m^2 pressure. Assuming a compressor efficiency of 85% and a turbine efficiency of 80%, determine for an air flow rate of 4 kg/s: (i) The power output of the plant.

(ii) Exhaust temperature from heat exchanger.

(iii) The thermal efficiency of the plant.

(iv) The thermal efficiency of plant without heat exchanger.

UNIT – IV

8 (a) Explain the different factors that are considered while selecting site for a hydro-electric power plant.

(b) The mean monthly discharge for 12 months at a particular site of a river as given below:

Month	Discharge in millions m^3 per month	Month	Discharge in millions m^3 per month
A (April)	500	0	2000
M	200	N	1500
J	1500	D	1500
J	2500	i	1000
A	3000	F	800
S	2400	M	600

Draw: (i) Hydrograph for the given discharge and find the monthly average flow. (ii) The power available at mean flow of water if the available head is 80 m at the site and the overall efficiency of generation is 80%.

OR

9 (a) Explain storage and pondage of water.

(b) Give complete note on working principle of a hydroelectric power plant with neat diagram.

UNIT – V

10 (a) Explain how power is produced from wind energy.

(b) Write a note on MHD power generation.

OR

11 (a) Sketch a general nuclear reactor and explain its components.

(b) Write a brief note on tidal energy harvesting.

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