

Code: 13A03804

B.Tech IV Year II Semester (R13) Regular Examinations April 2017

**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)

- Enumerate various 'types of tariff and explain any two of them.
- What are the considerations on which the location of a power plant depends?
- What do you understand by the term Boiler Draught?
- How are boilers classified?
- What are the advantages and disadvantages of diesel power plant?
- State the limitations of gas turbines.
- What is a spillway?
- What is cavitation? How can it be avoided?
- What is thermoelectric effect?
- State a hydrogen-oxygen fuel cell.

**PART – B**

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

**UNIT – I**

2 A power supply system has a hydro power plant of 12 MW capacity and diesel power plant of 30 MW capacity. The hydro power plant has a pondage provision and can store water to generate 120 MWh. For the coming week the estimated power in river flow is 3 MW and expected load to be supplied as follows.

Load (MW)	Time (hours)
42	20
30	60
25	50
15	20
8	18
Total = 168 hours	

- Calculate total energy that can be generated by hydro power plant.
- How the load shall be shared by the two power plants?

**OR**

3 A 60 MW power station has an annual peak load of 50 MW. The power station supplies loads having maximum demands of 20 MW, 17 MW, 10 MW and 9 MW. The annual load factor is 0.45. Find: (i) Average load. (ii) Energy supplied per year. (iii) Diversity factor. (iv) Demand factor.

**UNIT – II**

4 The steam at 36 bar and 350°C is supplied to a steam power plant working on a single stage regenerative cycle. The condenser pressure is 0.2 bar and the steam is at 5 bar. Calculate the regenerative cycle efficiency and compare it with that of Rankine cycle.

**OR**

5 Explain with a neat sketch of Lamont boiler. List the advantages and disadvantages.

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**UNIT – III**

- 6 A four cylinder four stroke SI engine is designed to develop 44 kW indicated power at a speed of 3000 rpm. The compression ratio used is 6. The law of compression and expansion is  $pV^{1.3} = \text{constant}$  and heat addition and rejection takes place at constant volume. The pressure and temperature at the beginning of compression stroke are 1 bar and 50°C. The maximum pressure of the cycle is limited to 30 bar. Calculate the dimensions and stroke of each cylinder assuming all cylinders have equal dimensions. Assume diagram factor = 0.8 and ratio of stroke / bore = 1.5.

**OR**

- 7 In an open cycle constant pressure gas turbine air enters the compressor at 1 bar and 300 K. The pressure of air after the compression is 4 bar. The isentropic efficiencies of compressor and turbine are 78% and 85% respectively. The air-fuel ratio is 80:1. Calculate the power developed and thermal efficiency of the cycle, if the flow rate of air is 2.5 kg/s. Take  $C_p = 1.005 \text{ kJ/kgK}$  and  $\gamma = 1.4$  for air and  $C_{pg} = 1.147 \text{ kJ/kgK}$  and  $\gamma = 1.33$  for gases.  $R = 0.287 \text{ kJ/kgK}$ . Calorific value of fuel = 42000 kJ/kg.

**UNIT – IV**

- 8 Explain two types of surge tanks with neat sketch.

**OR**

- 9 Explain in detail the hydro plant auxiliaries.

**UNIT – V**

- 10 Explain vertical axis wind mill turbine with all components and list out the advantaged and disadvantages.

**OR**

- 11 Explain flat plate solar collector with a neat sketch.

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