

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VII(NEW) • EXAMINATION – WINTER 2016

Subject Code:2171910

Date:01/12/2016

Subject Name:Power Plant Engineering

Time:10.30 AM to 1.00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of steam table and Mollier chart are allowed.

- Q.1** (a) Explain working of Bowl pulverizing mill with neat sketch. **07**
(b) A 200 MW thermal power plant has peak load of 130 MW. The power station supplies load to four town having their maximum demand of 30 MW, 40 MW, 25 MW and 45 MW. The annual load factor is 65%. Find: (i) Average load on the plant (ii) Energy supplied per year (iii) Diversity factor (iv) Demand factor (v) Plant capacity factor. **07**
- Q.2** (a) Explain pressure-velocity compounding of impulse turbine with diagram. **07**
(b) (i) Draw general layout of modern thermal power plant. **04**
(ii) State desirable to control the super heat temperature. Explain desuperheater method. **03**
OR
(b) Explain working of Schmidt-Hartmann boiler with neat sketch. **07**
- Q.3** (a) Define critical pressure. **07**
Derive $\frac{P_2}{P_1} = \left(\frac{2}{n+1}\right)^{\frac{n}{n-1}}$; where P_2 is throat pressure, P_1 is inlet pressure and n is the index of isentropic expansion of steam through the nozzle.
(b) The pressure and temperature of steam entering the nozzle are 12 bar and 200°C and steam leave the nozzle at 1 bar. The diameter of the nozzle at throat is 10 mm. Calculate the mass flow rate of steam in a nozzle and which type of nozzle is required? **07**
- OR**
- Q.3** (a) Steam issues from the nozzles at angle of 18° at a velocity of 450 m/sec. the friction factor is 0.88. For a single stage turbine designed for maximum efficiency, determine (i) Blade velocity (ii) Moving blade angles for equi-angular blades (iii) blade efficiency (iv) stage efficiency if the nozzle efficiency is 95% (v) Power developed for a mass flow rate of steam of 4 kg/sec. **07**
(b) Distinguish between force draught and induced draught. **03**
(c) Explain Unit pulverized coal handling system with neat sketch. **04**
- Q.4** (a) In a condenser, vacuum reads 716 mm of Hg while barometer reads 756 mm of Hg. The temperature of condensate is 25°C. Determine (i) The pressure of the steam and air (ii) Mass of air per kg of steam (iii) The vacuum efficiency. **07**
(b) Explain Zeolite ion exchange process for feed water treatment plant. **07**
- OR**
- Q.4** (a) A gas turbine operates on Brayton cycle. The temperature range is 1050 K and 288 K. Find pressure ratio for maximum power output. Also determine thermal efficiency, work ratio and power output, if the mass flow rate of air is 20 kg/sec. Take $C_p = 1.005$ kJ/kg K and $\gamma = 1.4$ for compression and expansion process. **07**
(b) Explain the parameters affected on work ratio in gas turbine power plant. **07**

- Q.5

(a)

List the nuclear reactors. Explain working of Pressurized water reactor.

07

(b)

Explain construction and working of Turbojet.

07
- OR
- Q.5

(a)

Define blade efficiency and derive an expression for maximum blade efficiency for single stage impulse steam turbine.

07

(b)

Derive an expression for air standard efficiency of ideal Bryton cycle in terms of pressure ratio. State the assumption made.

07
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