ME 224 (R-22)

Total No. of Questions : 10] [Total No.of Pages : 02

II/IV B. Tech. DEGREE EXAMINATIONS, AUGUST - 2024

Second Semester

MECHANICAL ENGINEERING

APPLIED THERMODYNAMICS

Time : **Three Hours** Maximum : **70** Marks

Answer ONE question from each Unit.

All Questions carry equal marks. 5x14=70 M

UNIT - I

1. A turbine takes dry steam at 20 bar and exhaust at 1.2 bar. The pressure at the release is 3 bar. Find : (a) The theoretical loss of work per kg of steam due to incomplete expansion and (b) The loss in Rankine efficiency due to restricted expansion of steam. (Neglect pump work).

(OR)

2. Explain different boiler mountings and their functions.

UNIT - II

3. A convergent divergent nozzle receives steam at 7 bar and 200^{o}c and it expands is entropically into a space of 3 bar neglecting the inlet velocity calculate the exit area required for a mass flow of 0.1 Kg/sec. When the flow is in equilibrium through all and super saturated with $PV^{1.3} = C$.

(OR)

4. Classify the different steam condensers and explain surface condenser with neat sketch.

UNIT - III

5. a) Explain the working of Pelton wheel turbine.

   b) Compare impulse turbine with reaction turbine.

(OR)

P.T.O.

6. A Pelton turbine is required to develop 1000 KW. When working under a head of 350 m the impeller may rotate at 500 rpm. Assuming a jet ratio of 10 and an overall efficiency of 85% calculate (i) Quantity of water required (ii) Diameter of the wheel (iii) Number of jets (iv)Number and size of the bucket vanes on the runner.

UNIT - IV

7. A refrigerator working on Bell-Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 100C. Air coming out of compressor is cooled to 300C before entering the expansion cylinder. Expansion and compression follow the law p.v 1.35 = constant. Determine C.O.P. of the system. Take γ=1.4 and Cp=1 kJ/kg-k for air.

(OR)

8. a) Explain different methods of refrigeration.

   b) Discuss about Bell Coleman cycle.

UNIT - V

9. a) Write down the properties of Psychometry.

   b) The air at 350C DBT and 250C WBT is passed through a cooling coil at the rate of 280 m^3/min. The air leaves the cooling coil at 26.50C DBT and 50% relative humidity. Find : (i) Capacity of the cooling coil in tonnes of refrigeration; (ii) Wet bulb temperature of the leaving air (iii) Water vapor removed per minute; (iv) Sensible heat factor.

(OR)

10. a) Explain the requirements of industrial air conditioning.

    b) 120 m^3 of air per minute at 300C DBT and 60% RH is cooled to 200C DBT by passing through a coil. Find, (i) Capacity of cooling coil in tons of refrigeration. (ii) Relative humidity of coming out air and its wet bulb temperature. Take atmospheric pressure as 1.033 bar.