Total No. of Questions :5] *[Total No. of Printed Pages : 2*

Roll No .....

AU/IP/IEM/PR/ME/AE-304

B.E. III Semester

Examination, June 2016

Thermodynamics

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Define Intensive properties.
   b) State Zeroth law of thermodynamics.
   c) What is perpetual motion machine of the first kind PMM1.
   d) State the first law for a closed system undergoing a change of state.

   OR

   Air enters a compressor at 10^5 Pa and 25°C having volume of 1.8 m^3/kg and is compressed to 5×10^5 Pa isothermally. Determine (i) Work done (ii) Change in internal energy (iii) Heat transfer

Unit - II

2. a) Define COP of heat pump and refrigerator?
   b) State Kelvin - Planck statement of second law of thermodynamic?
   c) Define reversible and irreversible process.
   d) State and proved the carnot's theorem.

   OR

   A cycle heat engine operates between a source temperature of 800°C and a sink temperature of 30°C. What is the least rate of heat rejection per kW net output of the engine.

Unit - III

3. a) What is an equation of state?
   b) Define PVT surface.
   c) Write Maxwell reactions for exact differential conditions.
   d) State and explain law of corresponding state and define critical compressibility factor.

   OR

   Write down the Vander Waals equation of state. What is force of cohesion? What is co volume?

Unit - IV

4. a) Define Pure substance.
   b) Draw h-s diagram or mollier diagram for a pure substance.
   c) Define sensible heat of water and dryness fraction.
   d) Explain measurement of steam quality (throttling calorimeter).

   OR

   A vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam at a temperature of 250°C. The mass of liquid present is 9 kg. Find pressure, the mass, the specific volume and internal energy.

Unit - V

5. a) Define Air standard efficiency?
   b) Define Ideal gas and what are its properties?
   c) Define internal energy of Gas mixture.
   d) Compare the efficiency of Otto, Diesel and Dual combustion cycles on the basis of compression ratio.

   OR

   A perfect gas undergoes a cycle which consists of the following process taken in order.
   a) Heat rejection at constant pressure.
   b) Adiabatic compression from 1 bar and 27°C to 4 bar.
   c) Heat addition at constant volume to a final pressure of 16 bar.
   d) Adiabatic expansion to 1 bar.

   Calculate i) Work done 1 kg of gas
   ii) Efficiency of the cycle.

   Take Cp = 0.92, Cu = 0.75.

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