C 40945 (Pages : 2) Name.....

Reg. No.....



**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION**
**APRIL 2013**

ME 09 406/PT ME 09 405—THERMODYNAMICS

Time : Three Hours Maximum : 70 Marks

## Part A

*Answer* **all** *the questions.*

1. Define path and point function.
2. Write the two statements of the Second law of thermodynamics.
3. What do you mean by "Calusius inequality" ?
4. What is meant by degree of super saturation and degree of under cooling ?
5. Write the Maxwell's questions and its significance.

(5 × 2 = 10 marks)

## Part B

*Answer any* **four** *questions.*

1. Explain the concept of temperature and equality of temperature.
2. Show that the internal energy is a property of the system.
3. Define wet bulb temperature and dew point temperature of moist air.
4. Deduce Clapeyron equation.
5. Explain the difference between a Perfect gas and a Real gas. What are the reasons of deviation of a Real gas from Perfect gas ?
6. Explain thermodynamic system, surroundings and universe, with examples.

(4 × 5 = 20 marks)

## Part C

*Answer any* **four** *questions.*

1. In an isentropic flow through nozzle, air flows at the rate of 600 kg/hr. At inlet to the nozzle, pressure is 2 MPa and temperature is 127°C. The exist pressure is 0.5 MPa. Initial air velocity is 300 m/s determine (i) Exit velocity of air (ii) Inlet and exit area of nozzle.
2. What is steady flow process ? Write down SFEE and assumptions you make for the following cases :
   (a) Boiler.
   (b) Compressor.
   (c) Nozzle.

**Turn over**

3. Air is compressed from a pressure of 1 bar and a temperature of 210°C to a pressure of 2 bar and temperature of 380°C. For this process determine :
   (a) Change in entropy.
   (b) Whether heat is added or removed or is it zero.
   (c) Also calculate the final temperature if the process were isentropic.
4. Explain : "Available energy" and "Availability" and Irreversibility.
5. One kg – mole of Oxygen undergoes a reversible non – flow isothermal compression and the volume decreases from 0.15 $m^3$/kg to 0.06 $m^3$/kg and the initial temperature is 50°C :
   (a) The work done during the process.
   (b) The final pressure.
6. Determine the pressure of air at 205°C having a specific of 0.00315 $m^3$/kg by means of :
   (a) Ideal gas equation. (b) Vander Waal's equation.
7. Using Maxwell's relations deduce the *two* Tds equations.
8. A room of dimensions 5 m × 3 m × 3 m contains an air water vapour mixture at 1 bar, 300 C and 70% relative humidity. Calculate :
   (a) Mass of air.
   (b) Mass of water vapour.

   The universal gas constant is 8.3143 kJ/kg—Mole K and molecular mass of air and water vapour is 29 and 18 respectively.

(4 × 10 = 40 marks)