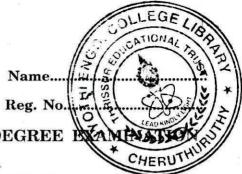
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# FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE APRIL 2013

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.

 $(5 \times 2 = 10 \text{ marks})$ 

### 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.

 $(4 \times 5 = 20 \text{ marks})$ 

### 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  $50^{\circ}C$ :
  - (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 m³/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  $\times$  3 m  $\times$  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.

 $(4 \times 10 = 40 \text{ marks})$