

C 40945

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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 $0.15 \text{ m}^3/\text{kg}$ to $0.06 \text{ m}^3/\text{kg}$ 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 $0.00315 \text{ m}^3/\text{kg}$ 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 $5 \text{ m} \times 3 \text{ m} \times 3 \text{ m}$ 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 $8.3143 \text{ kJ/kg--Mole K}$ and molecular mass of air and water vapour is 29 and 18 respectively.

(4 × 10 = 40 marks)