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Reg. No. : .....

Name : .....

Combined First and Second Semester B.Tech. Degree Examination, October 2014
(2013 Scheme)
13.107 : ENGINEERING THERMO DYNAMICS (MPNSU)

Time : 3 Hours Max. Marks :100

Instruction : ***Use*** *of approved steam tables and psychrometric charts are* ***permitted*** *in the Examination Hall.*

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. What is a thermodynamic cycle ?
2. What is a Quasi-static process ?
3. Define density using concept of continuum.
4. What is PMM 2 ?
5. Define the COP of a refrigerator.
6. What are the causes of entropy increase ?
7. Define isothermal compressibility.
8. What is the Joule – Thomson coefficient for an ideal gas ?
9. What is Boltzmann constant ?
10. Define Dew point temperature.

P.T.O.

PART – B

Answer **one full** question from **each** Module. Question carries **20** marks.

Module – I

11. a) Steam at 2 bar and 300°C enters a horizontal nozzle with negligible velocity and leaves at 0.2 bar. Determine the exit velocity of steam. Enthalpy for steam at 0.2 bar is 2609.9 kJ/kg and at 2 bar and 300°C is 3072.1 kJ/kg.

    b) A gas is compressed from 0.3 m^3, 0.105 MPa to 0.15 m^3 and 0.105MPa at constant pressure. The heat transfer from the gas is 37.6 kJ. Find charge in internal energy.

OR

12. a) 1.5 kg of liquid having a constant specific heat of 2.5 kJ/kg K is stirred in a well - insulated chamber causing the temp. to rise by 15°C. Find Δ E and W.

    b) A system receives 200 kJ of energy as heat at constant volume. Then it is cooled at constant pressure. During the constant pressure process 50 kJ of work was done on the system while it rejects 70 kJ of energy as heat. Suppose the system is restored to the initial state by an adiabatic process, how much work will be done by the system ?

Module – II

13. a) Prove that two reversible adiabatic lines cannot intersect.

    b) Determine the temperature in °C at which energy is added to a Carnot cyclic heat engine which rejects 100 kJ/s of energy to a sink at 290 K while delivering 50 kW power. Also calculate the rate of energy absorption.

OR

14. a) What is available energy ?

    b) 0.2 kg of air at 300°C is heated reversibly at constant pressure to 2066 K. Find the available and unavailable energies of the heat added. Take T_0 = 30°C and C_p = 1.00 47 kJ/kg K.

Module – III

15. a) Define volume expansivity.

    b) Show that the internal energy and enthalpy of an ideal gas are functions of temperature only.

OR

16. a) Prove that a gas which has the equation of state $P(v - b) = RT$ does not exibit a change in Cp as the pressure is changed.

    b) What is Clapeyron equation ?

Module – IV

17. a) What is meant by gravimetric analysis ?

    b) It is necessary to prepare a mixture of helium and carbon dioxide so that the molar mass of the mixture is 30 kg /K mol. Determine the volume ratio in which helium and carbon dioxide are to be mixed.

OR

18. a) What is an adiabatic saturation process ?

    b) The dry-bulb and wet-bulb temperature of air in a room are 30°C and 20°C respectively. If the air in the room is at 0.9 bar pressure, determine the specific humidity and relative humidity of the air in the room.
