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A – 4129

Reg. No. : .....

Name : .....

Combined First and Second Semester B.Tech. Degree Examination, December 2016
(2013 Scheme)
13.107 : ENGINEERING THERMO DYNAMICS (MPNSU)

Time : 3 Hours

Max. Marks : 100

Instructions : ***Use*** *of approved steam tables and psychrometric chart* ***permitted*** *in examination hall.*

PART – A

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

1. Explain briefly the Macroscopic and Microscopic view points of thermodynamics.
2. State and briefly explain Zeroth law of thermodynamics.
3. Define work and heat.
4. Write down the statements explaining the II law of thermodynamics.
5. Define heat engine and heat pump.
6. What is reversibility ?
7. What is the significance of Helmholtz and Gibb's functions ?
8. Explain Mollier chart and explain how it helps in steam calculations.
9. Differentiate between mass fraction and volume fraction.
10. Explain Psychrometric chart.

PART – B

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

Module – I

11. a) What do you mean by Thermodynamic equilibrium ?

    b) Explain point and path functions. State examples.

c) Consider a gas enclosed in a piston-cylinder assembly as the system. The gas is initially at a pressure of 500 KPa and occupies a volume of 0.2 m^3. The gas is taken to the final state at P_2 = 100 KPa by the following two different processes. Calculate the work done. The two cases are

i) Volume of gas is inversely proportional to pressure

ii) The process follows the path $PV^{1.4}$ = Constant.

OR

12. a) State first law of thermodynamics. How is it applied to flow and non flow problems ?

b) A fluid is confined in a cylinder by a spring-loaded, frictionless piston so that the pressure in the fluid is a linear function of the volume (P = a + bV). The internal energy of the fluid is given by the following equation
U = 34 + 3.15 pV (U is in kJ, p in KPa and V in m^3).
If the fluid changes from an initial state of 170 KPa, 0.03 m^3 to a final state of 400 KPa, 0.06 m^3 with no work other than that done on the piston, find the magnitude and direction of work and heat transfer.

Module – II

13. a) Explain the limitations of first law of thermodynamics.

b) State and explain carnots theorem and its corollaries.

c) What are the causes of irreversibility ?

OR

14. a) State and explain classius inequality.

b) Derive expressions for entropy changes in various thermodynamic processes.

Module – III

15. a) Define pure substance. Explain P-V and P-T diagrams of a pure substance.

b) 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 the liquid present is 9 kg. Find the pressure, mass, specific volume, enthalpy, entropy and internal energy of the mixture.

OR

16. a) Obtain T-ds equations.

    b) Derive equations for difference in heat capacities and their ratio.

    c) Explain law of corresponding states.

Module – IV

17. a) Explain Gravimetric Analysis.

    b) A mixture of ideal gases consist of 3 kg of nitrogen and 5 kg of carbon dioxide at a pressure of 300 KPa and a temperature of 20° C. Find

        a) The mole fraction of the constituent

        b) The equivalent molecular weight of the mixture

        c) The equivalent gas constant of the mixture

        d) The partial pressures and partial volumes

        e) The volume and density of the mixture and

        f) C_p and C_v of the mixture,

    If the mixture is heated at constant volume to 40°C, find the changes in internal energy, enthalpy and entropy of the mixture ($\gamma_{CO_2} = 1.286$, $\gamma_{N_2} = 1.4$).

OR

18. Write short notes on the following :

    a) Dry Bulb Temperature

    b) Wet Bulb Temperature

    c) Dew Point Temperature

    d) Relative humidity

    e) Degree of Saturation.