ASSIGNMENT

UNIT – I

**Q1** Explain the state of equilibrium. Also discuss thermal, chemical and mechanical equilibrium with suitable examples.

**Q2.** Explain the different types of systems with neat sketches and suitable examples.

**Q3.** Explain Zeroth law of Thermodynamics

**Q4.** Define the temperature. Name the different temperature scales in common use and establish a relation between Celsius and Fahrenheit scale.

**Q5.** Write short notes on following:

1. Equality of temperature
2. Law of perfect gases
3. Process and cycle
4. Point Function, Path Function

Q.6 The pressure of steam inside a boiler, as measured by pressure gauge, is 1 N/mm2. The barometric pressure of the atmosphere is 765mm of mercury. Find the absolute pressure of steam in N/rn2, kPa, bar and N/mm2.

Q.7 Calculate the quantity of heat required to raise the temperature of a steel forging of mass 180 kg from 300 K to 1265 K. The specific heat of steel = 0.49 KJ/kg K.

Q.8 An engine works between the temperature limits of 1775 K and 375 K. What can be the maximum thermal efficiency of this engine?

Q.9 A spherical vessel of 1.5 m diameter, containing air at 40° C is evacuated till the vacuum inside the vessel becomes 735 mm of Hg. Calculate the mass of air pumped out, if the tank is then cooled to 3° C, what will be the final pressure in the tank ? Take atmospheric pressure as 760 mm of Hg.

Q.10 A mass of 2.25 kg of nitrogen occupying 1.5 m3 is heated from 25o C to 200° C at a constant volume. Calculate the initial and final pressures of the gas. Take universal gas constant as 8314 J/kg mol K. The molecular mass of nitrogen is 28.

Q.11 A mass of 0.25 kg of air in a closed system expand from 2 bar, 60° C to 1 bar and 40o C while receiving 1.005 kJ of heat from a reservoir at 100o C. The surrounding atmosphere is at 0.95 bar and 27o C. Determine the maximum work. How much of this work would he done on the atmosphere?

Q.12 A certain gas has Cp = 1.96 kJ/kg K and Cv = 1.5 kJ/kg K. Find its molecular mass and gas constant. A constant volume chamber of 0.3 m3 capacity contains 2 kg of this gas at 5° C. The heat is transferred to the gas until the temperature is 100° C. Find the work done, heat transferred and change in internal energy.

Q.13 A quantity of air has a volume of 0.4 m3 at pressure of 5 bar and temperature of 80o C. It is expanded in a cylinder at a constant temperature to a pressure of 1 bar. Determine the amount of work done by the air during expansion.

Q.14 A system contains 0.15 m3 of a gas at a pressure of 3.8 bar and 150o C. It is expanded adiabatically till the pressure falls to 1 bar. The gas is then heated at a constant pressure till its enthalpy increases by 70 KJ. Determine the total work done. Take Cp, = 1 KJ/kg K and Cv = 0.711 kJ/kgK.

Q.15 In a gas turbine, the gases flow at the rate of 5 kg/s. The gases enter the turbine at a pressure 7 bar with a velocity 120 rn/s and leaves at a pressure 2 bar with velocity 250 m/s. The turbine is insulated. If he enthalpy of the gas at inlet is 900 kJ/kg and at outlet 600 kJ/kg, determine the capacity of the turbine.