ME 8391 Engineering Thermodynamics
Important 13Mark Questions

Unit I

1. Derive the expression for the displacement work.
2. The power output of an adiabatic steam turbine is 5 MW, and the state of steam entering the turbine is; pressure 2 MPa; Temperature 400^0 C; velocity 50 m/s; elevation 10 m. The state of the steam leaving the turbine is: pressure 15 kPa; dryness fraction 0.9; velocity 180 m/s; elevation 6 m. Determine,
   (i) the change in enthalpy, kinetic energy and potential energy.
   (ii) the work done per unit mass of the steam flowing through the turbine.
   (iii) the mass flow rate of the steam.

Unit II

1. Show that the efficiency of the reversible heat engine depends only on the maximum and minimum absolute temperature in the cycle.
2. Air expands through a turbine from 500 kPa, 520^0 C to 100 kPa, 300^0 C. During expansion 10kJ/kg of heat is lost to the surroundings which is at 98 kPa, 20^0 C. Neglecting the kinetic and potential energy changes, determine per kg of air,
   (i) The decrease in availability,
   (ii) The maximum work, and
   (iii) The irreversibility. For air C_p = 1.005kJ/kgK and h = C_pT.

Unit III

1. A pressure cooker contains 1.5 kg of saturated steam at 5 bar. Find the quantity of heat which must be rejected so as to reduce the quality to 60% dry. Determine the pressure and temperature of the steam at the new state.
2. Draw the schematic diagram of Rankine cycle and explain its working with the help help of h-s diagram. Also discuss Rankine cycle improvements.

Unit IV

1. Explain the principle of corresponding states and the use of compressibility chart.
2. Explain Joule – Thomson experiment and deduce the expression for Joule – Thomson coefficient.

Unit V

1. Atmosphere air at 38^0C and 25% relative humidity passes through an evaporator cooler. If the final temperature of air is 18^0C, how much water is added per kg of dry air and what is the final relative humidity?
2. Explain the mole fraction and mass fraction and the relationship between them.