2074
B.E. (Mechanical Engineering)
Seventh Semester
MEC-701: Refrigeration and Air Conditioning

Time allowed: 3 Hours   Max. Marks: 50

*NOTE: Attempt **five** questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.*

x-x-x

Q1.   (2X5=10)

  a) Write any five applications of Air conditioning.
  b) What is the effect of superheating on Refrigeration work?
  c) Draw the sketch of Electrolux Refrigeration system.
  d) Define GSHF and Bypass factor.
  e) Differentiate between Ventilation load and Infiltration load.

PART-A   (2X10)

Q2   For a vapour compression refrigeration system using R-22 as refrigerant, condenser outlet temperature is 40°C and evaporator inlet temperature is -20°C. The refrigerant at the exit from condenser is subcooled to 26°C with the help of refrigerant coming out from evaporator. The refrigerant leaves the evaporator as saturated vapour. The compression is isentropic. Find the power requirement and COP if capacity of the system is 10 kW at -20°C. Show cycle on P-h chart. Take c_p of vapour as 1.03 kJ/kg K.

Q3   Explain with schematic simple vapour absorption refrigeration system and its advantages and limitations.

Q4   The capacity of a Carnot refrigerator is 450 tonnes, when working between -15°C and 30°C. Find out the mass of ice produced within 24 hours when water is supplied at 20°C. Also find out the minimum power required. Assume the machine to be working on Carnot cycle. Take latent heat of ice as 335 KJ/kg.

PART-B   (2X10)

Q5   An air conditioning system is designed for industrial process for hot and wet summer conditions. Outdoor conditions 30 °C DBT and 75% RH, required conditions 22 DBT and 70% RH, amount of free air circulated 200 m³/min. coil dew point temperature is 14 °C. The required condition is first achieved by cooling and dehumidifying and then by heating. Find the cooling capacity of cooling coil and its bypass factor, heating capacity of the heating coil in kW and surface temperature of the heating coil if its bypass factor is 0.2 and mass of water vapour removed per hour.

Q6 An air-conditioning system is designed for a restaurant when the following data is available: total heat gain through walls, roof and floor 21200 kJ/hr, solar heat gain through glass 6800 kJ/hr, equipment sensible heat gain 10000 kJ/hr, equipment latent heat gain 2400 kJ/hr, sensible heat gain per person 200 kJ/hr, latent heat gain per person 160 kJ/hr, total infiltered air 400m³/hr, outdoor conditions 35°C DBT & 26°C WBT, inside design conditions 27°C DBT & 55% RH, minimum temperature of the air supplied to the room 17 °C DBT, total amount of fresh air supplied 1600 m³/hr, seating chairs for dining 100, employees serving the meals 10. Find amount of air delivered in cum/hour, percentage of re-circulated air, refrigeration load on the coil in tons of refrigeration and DPT of the coil and its bypass factor.

Q7 (a) What is the necessity of a cooling tower in an air conditioning system? Sketch and explain working of forced and induced draft cooling towers.
(b) What different types of expansion device are used in air conditioning systems? Sketch and explain working of any two.

x-x-x