Exam.Code:0943
Sub. Code: 33880

2076

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 Unit. Support your answers with neat diagrams as applicable. Use of Refrigeration charts and tables is allowed.

x-x-x

1. Write fill in blanks/short answers:

   a) A heat pump working on reversed Carnot cycle has COP of 5. If it works as refrigerator taking 1kW as work input. The refrigeration effect will be_____.

   b) The _____ atom in the molecule of refrigerant is responsible for depletion of ozone layer and _____ atom in the molecule is responsible for global warming.

   c) Write two benefits of multi-stage compression of the refrigerant in low temp applications.

   d) What is wet bulb depression? Define enthalpy deviation during adiabatic saturation process?

   e) Differentiate between Ventilation load and Infiltration load in air conditioning. (5x2)

UNIT - I

2. A cold storage plant is required to store 20 tonnes of fish. The temperature of the fish when supplied is 25°C, storage temperature of the fish is -8°C, specific heat of fish above freezing point is 2.93 kJ/kg°C, specific heat of the fish below freezing point is 1.23 kJ/kg°C, freezing of the fish takes place at -3°C, latent heat of the fish is 232 kJ/kg. If the cooling is achieved in 8 hours, find out: capacity of the refrigerating plant, Carnot COP between this temp range, if the actual COP is $1/3^{rd}$ of the Carnot COP find power required to run the plant. (10)

P.T.O.

3. A R-12 vapour compression refrigeration system has a condensing temperature of 50°C and evaporating temperature of 0°C. The refrigeration capacity is 7 tonnes. The liquid leaving the condenser is saturated liquid and compression is isentropic. The enthalpy at the end of compression is 210 kJ/kg. Determine: the refrigerant flow rate, power required to run the compressor, heat rejected in the plant, COP of the system. (10)

4. An aircraft is flying at 8000 m at 900 km/hr, where ambient air is at 0.341 bar and 263K temperature. The compression ratio of the compressor is 5. The cabin pressure is 1.01325 bar and temperature is 27°C. on the basis of 1 kg/sec flow of air, calculate: the power requirement of the aircraft for pressurisation (excluding ram work), additional power for refrigeration and the refrigeration effect. (10)

UNIT - II

5. Explain the significance of normal boiling point of refrigerant and discuss other thermodynamic properties that are required in refrigerants. (10)

6. Explain with sketch working of single effect Water-Lithium Bromide absorption chiller. What applications it is found suitable for? (10)

7. Air flowing at 100 m^3/min at 40°C DBT and 50% RH is mixed with another stream flowing at the rate of 20m^3/min at 26°C DBT and 50% RH. The mixture flows over a cooling coil whose ADP temperature is 10°C and bypass factor is 0.2. Find DBT and RH of the air leaving the coil. If this air is supplied to an air-conditioned room where DBT of 26°C and RH of 50% are maintained, estimate the room sensible heat factor (RSHF) and cooling capacity of the coil in tonnes of refrigeration. (10)

x-x-x