

1078

**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. Support your answers with neat diagrams as applicable. Refrigeration and Air conditioning charts and tables are allowed.

x-x-x

1. Answer/fill in blanks the following
 - (a) Explain a Ton of refrigeration.
 - (b) When the refrigerant is superheated **at the end of compression** in vapour compression system, such a compression is called _____.
 - (c) Give COP expression for heat pump
 - (d) Dehumidification will take place **along with cooling** if moist air flows over cooling coil whose surface temperature is below the _____ temperature of entering air.
 - (e) COP of vapor compression system **decreases both with** _____ evaporation pressure and _____ condenser pressure.
 - (f) The _____ atom in the molecule of refrigerant is responsible for depletion of ozone layer and _____ atom in the molecule is responsible for global warming.
 - (g) A positive pressure in refrigeration **system is required** in order to eliminate possibility of _____.
 - (h) Explain relative humidity.
 - (i) Explain dew point temperature.
 - (j) _____ refrigerant is replacement for R11 in large capacity centrifugal machines. 1 X 10 = 10

Part-A

2. Explain with sketch working of reversed **Carnot cycle** & discuss its limitations. Derive an expression for COP of refrigerating machine, heat pump & heat engine. 5
 - (b) A cold storage plant is required to store **20 tonnes** of fish. The fish is supplied at 30°C. Specific heat of the fish above **freezing point** is 2.93 kJ/kg K and below freezing point 1.26 kJ/kg K. the fish is **stored in cold store** maintained at -8 °C. Freezing point of fish is -4 °C and latent **heat 235 kJ/kg**. If plant requires 75 kW to drive it find plant capacity and time taken to **achieve cooling**. Assume actual COP as 0.3 of Carnot COP. 5
3. a) Explain with sketch Electrolux **refrigeration** system and discuss its applications. 5
 - (b) Compare vapour absorption system **with vapour compression system**. 5
4. (a) Draw actual vapor compression system **and explain** deviations from theoretical system. 5
 - (b) In a 15 TR ammonia refrigeration **plant, the condensing temperature is 25 °C** and evaporating temperature is -10 °C. **Refrigerant is sub-cooled by 5 °C** before

passing to expansion device. The vapour leaving the evaporator is 0.97 dry. Find COP and power required. 5

Part-B

5. Discuss in detail desirable thermodynamic, chemical and physical properties of an ideal refrigerant. 10
6. The total room cooling load was estimated to be 140,000 kJ/hr when the ambient and inside design conditions are DBT 40 °C, WBT 30 °C and DBT 27 °C and 60 % RH respectively. The bypass factor of the cooling coil is 0.14 and ADP being 4.5 °C lower than that of DPT corresponding to room design condition. Find ADP, volume of air supplied to the room, tonnage of the cooling coil. Show all state points on psychrometric chart. 10
7. (a) What are different types of evaporators used in air conditioning? Sketch and explain flooded evaporator and dry expansion evaporator its application. 5
- (b) Explain the following terms & discuss their applications in air conditioning:
 - (i) Thermostatic expansion valve.
 - (ii) Rotary Compressors. 5