

(3 hours)**Max. Marks: 80****Instructions:**

- (1) Solve any four questions.
- (2) Figures to the right indicate full marks.
- (3) Assume suitable data wherever necessary and mention it clearly.
- (4) Answers to the sub question of an individual question should be written together and one below other.
- (5) Use of Refrigerant Charts, Psychrometric Chart and Steam Tables is allowed.
- (6) All questions carry equal marks

- Q1**
- a) List down types of compound compression systems. What are the advantages of compound compression over single stage compression? **5**
 - b) Discuss the HCFC-22 phaseout Schedule in India. **5**
 - c) With the help of a neat sketch discuss a Year round Air Conditioning system. Explain each component in the System. **10**
- Q2**
- a) 25 m³ of air at 15 °C DBT and 13 °C WBT is mixed with 15 m³ of air at 25 °C DBT and 18 °C WBT. Assuming barometric pressure of one standard atmosphere, determine the DBT and WBT of the resulting mixture. **10**
 - b) What are the types of throttling devices? Discuss in details with a neat sketch the working of a thermostatic expansion valve. **10**
- Q3**
- a) Compare LiBr- Water and Aqua – Ammonia absorption refrigeration system. **5**
 - b) A vapor compression refrigeration system of 10 TR capacity using R-22 works on evaporator and condenser temperature of -10 °C and 40 °C. Using P-h chart, calculate : **10**
 - i) Compressor power
 - ii) COP
 - iii) Mass flow rate
 - iv) Piston displacement assuming Volumetric efficiency = 100 % and
 - v) Heat rejected.
 - c) What are natural refrigerants? Discuss with application of each type. **5**

- Q4** A hall is to be maintained at 24 °C dry bulb temperature and 60 % relative humidity under the following conditions : **20**
- Outdoor conditions = 38 °C DBT and 28 °C WBT
Sensible heat load in the room = 48.4 kW
Latent heat load in the room = 13.6 kW
Total infiltration air = 1200 m³/hr
Apparatus dew point temperature = 10 °C
Quantity of recirculated air from the hall = 60 %
If the quantity of recirculated air is mixed with the conditioned air after the cooling coil, find the following :
- The condition of air leaving the conditioner coil and before mixing with the recirculated air
 - The condition of air before entering the hall
 - The mass of air entering the cooler
 - The mass of total air passing through the hall
 - The by-pass factor of the cooling coil ; and
 - The refrigeration load on the cooling coil in Tons of Refrigeration.
- Q5** a) What are the possible sources of noise and vibration in an air conditioning system? Discuss methods used to reduce the noise level and isolate vibrations. **10**
- b) Explain with neat sketches DX and flooded evaporators. **10**
- Q6** Write short notes (any four) : **20**
- Air Washers
 - Marine Air Conditioning
 - Pressure and Temperature Controls
 - ASHRAE Numbering System of Refrigerants
 - Split Air Conditioners
 - LEED Rating System for Green Buildings
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