

(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 m^3 of air at 15°C DBT and 13°C WBT is mixed with 15 m^3 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. **5**
 - c) What are natural refrigerants? Discuss with application of each type. **5**

- Q4** A hall is to be maintained at $24\text{ }^{\circ}\text{C}$ dry bulb temperature and 60% relative humidity under the following conditions : **20**
- Outdoor conditions = $38\text{ }^{\circ}\text{C}$ DBT and $28\text{ }^{\circ}\text{C}$ WBT
 Sensible heat load in the room = 48.4 kW
 Latent heat load in the room = 13.6 kW
 Total infiltration air = $1200\text{ m}^3/\text{hr}$
 Apparatus dew point temperature = $10\text{ }^{\circ}\text{C}$
 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