**16172**

**3 Hours / 100 Marks**      Seat No. ⬚⬚⬚⬚⬚⬚⬚⬚

---

***Instructions :***    (1)    All Questions are *compulsory.*

(2)    Answer each next main Question on a new page.

(3)    Illustrate your answers with neat sketches wherever necessary.

(4)    Figures to the right indicate full marks.

(5)    Assume suitable data, if necessary.

(6)    Use of psychrometric chart is permitted.

**Marks**

**1.    Attempt any FIVE :**                                                    **5 × 4 = 20**

(a)    (i)    Define the term refrigeration and state it's unit.

(ii)    Explain the term "Global Warming".

(b)    Define heat pump and refrigerator. Show it on block diagram.

(c)    Compare primary and secondary refrigerant.

(d)    Name the refrigerant used for

(i)    Air conditioner

(ii)    Domestic refrigerator

(iii)    Ice plant

(iv)    Water cooler

(e)    An inventor has claimed to have manufactured a refrigerator having COP 7.4 When working between –10 °C and 30 °C. Check whether his claim is correct or not.

(f)    Sketch bell Coleman cycle on P-V & T-S diagram. List processes involved.

(g)    Draw a neat labelled sketch of steam jet refrigeration.

2. **Attempt any FOUR :** 4 × 4 = 16

(a) Draw vapour compression refrigeration cycle on P-H and T-S chart and label the different processes.

(b) Define superheating of refrigerant. Show it on P-H and T-S chart. State if it is desirable and why ?

(c) State the necessity of multistage vapour compression refrigeration system and it's Four advantages.

(d) Draw neat sketch of practical vapour absorption refrigeration system.

(e) Sketch comfort chart and show on it comfort zone.

(f) Enlist any four Industrial application of air-conditioning.

3. **Attempt any FOUR :** 4 × 4 = 16

(a) Classify compressor.

(b) Compare open type and hermetically sealed compressor.

(c) Explain the principle of operation of evaporative condenser with neat sketch.

(d) Why capillary tube is used in all domestic appliances as an expansion device ?

(e) Draw labelled diagram of thermostatic expansion valve and explain its working.

(f) Differentiate between air cooled and water cooled refrigeration condenser. (any four)

**4.** **Attempt any FOUR :** **4 × 4 = 16**

(a) Define : (i) RH (ii) DBT (iii) DPT (iv) Specific humidity

(b) Explain concept of sensible heat factor and by pass factor with suitable sketches.

(c) List types of humidifiers and explain any one of them with neat sketch.

(d) Show following processes on psychrometric chart.

   (i) Cooling with dehumidification.

   (ii) Heating and Humidification.

(e) Draw neat sketch of window air-conditioner and explain its working.

(f) List any four desirable properties of Insulating material.

**5.** **Attempt any TWO :** **8 × 2 = 16**

(a) What is sensible and latent heat gain ? List the sources of sensible and latent heat gain in a restaurant.

(b) Refrigeration system works on VCR system.

   Enthalpies at various points are given below :

   Compressor inlet = 1460 kJ/kg

   Compressor outlet = 1796 kJ/kg

   Inlet to expansion valve = 322 kJ/kg

   The refrigerant is superheated by 15 °C before it enters the compressor and subcooled by 3 °C before expansion. Show the cycle on PH and T-S chart. Find (i) COP (ii) Power required for 1 kg of refrigerant circulated/min.

(c) Explain Automobile air-conditioning system.

**6.** **Attempt any TWO :** **8 × 2 = 16**

(a) Explain Air-conditioning system for Hot and Dry weather with neat sketch. Represent it on psychrometric chart.

(b) List the three duct systems (duct layout) and describe closed perimeter duct system. Draw the relevant sketch for the same.

(c) With the help of psychrometric chart find properties of air at 24 °C DBT and 40 % Relative humidity.

    (i) Dew point temperature

    (ii) Wet bulb temperature

    (iii) SP volume of air

    (iv) Enthalpy of air

    (v) SP humidity of air

Draw psychrometric chart showing all above properties.

_____