

22660

21222

3 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Use of Psychrometric chart is permitted.

Marks

1. Attempt any FIVE of the following :

10

- (a) Define unit of Refrigeration.
- (b) State the factors affecting on human comfort.
- (c) Write designation (Number) of refrigerants CHClF_2 and $\text{C}_2\text{Cl}_2\text{F}_4$.
- (d) List the advantages of hermetically sealed compressor.
- (e) Represent sensible heating process on psychrometric chart.
- (f) Define wet bulb depression.
- (g) List the desirable properties of insulating materials used in air conditioning systems.

- 2. Attempt any THREE of the following : 12**
- (a) Represent Bell-Coleman air refrigeration cycle on P-V and T-S diagram.
 - (b) List the desirable properties of Ideal refrigerants.
 - (c) Explain with neat sketch the working of flooded evaporator.
 - (d) Represent following psychrometric processes on Psychrometric chart :
 - (i) Sensible cooling
 - (ii) Cooling with adiabatic humidification
- 3. Attempt any THREE of the following : 12**
- (a) A refrigerator of 12 tons capacity works on reversed carnot cycle and in the temperature range of 35 °C and –15 °C. Determine :
 - (i) COP of the system
 - (ii) Power required to run the system (kW)
 - (iii) Heat rejected by the system in kJ/s.
 - (b) Explain the concept of Global warming and Ozone layer depletion.
 - (c) Explain the working of household refrigerator with neat sketch.
 - (d) Draw layout of Automobile air conditioning system.
- 4. Attempt any THREE of the following : 12**
- (a) Explain the working of window air conditioner with neat sketch.
 - (b) Represent Carnot cycle on P-V and T-S diagram.
 - (c) Sketch and explain extended plenum duct system.
 - (d) Explain air conditioning system for hot and dry weather with neat sketch. Represent it on psychrometric chart.
 - (e) Differentiate between air cooled and water cooled refrigeration condenser.

5. Attempt any TWO of the following :

12

- (a) A 5 ton R-12 refrigeration plant has saturated suction temperature of $-5\text{ }^{\circ}\text{C}$. The condensation takes place at $32\text{ }^{\circ}\text{C}$ and there is no under-cooling of refrigerant liquid. Assuming isentropic compression, find

- (i) COP of the plant.
 (ii) Mass flow rate of refrigerant in kg/sec.
 (iii) Power required to run the compressor in kW.

If refrigerant is dry and saturated at the inlet to compressor.

Take the following properties of R-12.

T ($^{\circ}\text{C}$)	P (bar)	h_f (kJ/kg)	h_g (kJ/kg)	S_g (kJ/kg K)
32	7.85	130.5	264.5	1.542
-5	2.61	124.2	249.3	1.557

Take $C_p(\text{vapour}) = 0.615\text{ kJ/kg K}$.

- (b) Draw neat labelled sketch of practical aqua-ammonia vapour absorption refrigeration system and explain its working.
 (c) Explain with neat sketch the working of thermostatic expansion valve.

6. Attempt any TWO of the following :

12

- (a) Atmospheric air at a dry bulb temperature of $16\text{ }^{\circ}\text{C}$ and 30% relative humidity passes through a furnace and then through a humidifier, in such a way that the final dry bulb temperature is $30\text{ }^{\circ}\text{C}$ and 50% relative humidity. Plot the process on Psychrometric chart and find

- (i) Heat added to the air,
 (ii) Moisture added to the air,
 (iii) Sensible heat factor of the process.

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- (b) List different pressure losses in ducts.
 - (c) Discuss the different types of heat loads which have to be taken into account in order to estimate the total heat load of auditorium of your institute for summer air conditioning for 200 students.
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