

# 17612

16117

**3 Hours / 100 Marks**

Seat No.

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- 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) Mobile Phone, Pager and any other Electronic Pocket Calculator is permissible.
  - (7) Use of Psychometric chart is permitted.

**Marks**

1. a) **Attempt any THREE of the following:** **12**
  - (i) State the law related to refrigeration and define EER thermodynamic.
  - (ii) State methods of improving COP and explain any one method.
  - (iii) Classify compressors used in refrigeration system.
  - (iv) Define:
    - 1) Dew point depression
    - 2) Relative humidity
  
- b) **Attempt any ONE of the following:** **6**
  - (i) State and explain factors affecting human comfort.
  - (ii) Draw schematic diagram of year round air conditioner and explain its working,

P.T.O.

**2. Attempt any TWO of the following:****16**

- a) A vapour compression refrigerator uses R-12 as a refrigerant and the liquid evaporates in the evaporator at  $-15^{\circ}\text{C}$ . The temperature of this refrigerant at the delivery from the compressor is  $15^{\circ}\text{C}$ . When the vapour is condensed at  $10^{\circ}\text{C}$ ; find the COP if
- There is no under cooling
  - The liquid is subcooled by  $5^{\circ}\text{C}$  before expansion by throttling.

Take specific heat at constant pressure for the super heated vapour as  $0.64 \text{ kJ/kg}^{\circ}\text{K}$ . and that of liquid as  $0.94 \text{ kJ/kg}^{\circ}\text{K}$ .

The other properties of refrigerant are as follows.

Temp $^{\circ}\text{C}$	Enthalpy (kJ/kg)		Specific Entropy (kJ/kg $^{\circ}\text{K}$ )	
	Liquid	Vapour	Liquid	Vapour
-15	22.3	180.88	0.0904	0.7051
10	45.4	191.76	0.1750	0.6921

Sketch the P – H and T – S diagram for both conditions.

- State functions of expansion devices and give classification of same. Explain construction and working of thermostatic expansion valve with neat sketch.
- List psychometric processes and explain evaporative cooling process with sketch.

**3. Attempt any FOUR of the following:****16**

- State any eight desirable properties of refrigerant.
- What is ozone layer depletion? What are the remedies to save ozone in atmosphere?
- State various industrial and commercial application of air conditioning.
- Differentiate between central and unitary air conditioning system.
- Differentiate industrial and commercial applications of air conditioning system.

- 4. a) Attempt any THREE of the following:** **12**
- (i) State the effect of super heating and subcooling on COP with pH and T-S diagram.
  - (ii) Explain concept of SHF and RSHF.
  - (iii) Explain automobile air conditioning system with neat sketch.
  - (iv) List the commonly used insulating materials and state any four desirable properties of insulating materials.
- b) Attempt any ONE of the following:** **6**
- (i) Explain losses in ducts.
  - (ii) What are different types of heat loads to be taken into account to calculate the heat load of computer lab of your institute?
- 5. Attempt any TWO of the following:** **16**
- a) Draw neat sketch of 'Electrolux' refrigeration system and explain its working in detail.
  - b) Explain the working of flooded evaporator with neat sketch. State its applications.
  - c) Air is supplied to a conditioned room at 17°C DBT and 50% RH. The air leaves the room at 25°C DBT during which RH increases by 5%. Find
    - (i) DPT of supply air
    - (ii) Change in enthalpy during process.
    - (iii) Change in specific humidity during the process.Show it on psychrometric chart.

**6. Attempt any FOUR of the following:****16**

- a) Draw schematic diagram of Bell-Coleman air refrigeration cycle with P-V and T-S diagram.
  - b) Give classification of refrigerants and state at least one refrigerant name in each refrigerant type.
  - c) What is need of multistaging? State advantages and limitations of it.
  - d) Explain pulse tube refrigeration system.
  - e) Explain working of dry expansion type chillers with sketch.
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