

17612

**11920**

**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) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
  - (8) Use of steam tables, logarithmic, Mollier's chart, Psychrometric chart is permitted.

**Marks**

**1. Attempt any FIVE of the following :**

**20**

- (a) Define the terms
  - (i) Energy Efficiency Ratio (EER)
  - (ii) Refrigerating effect
- (b) Explain the concept of green house effect and global warming.
- (c) Draw Bell – Coleman cycle on P-V and T-S diagram and label the processes.
- (d) Draw a neat labelled symmetric diagram of simple vapour compression refrigeration system.
- (e) Explain the effects of superheating of suction vapour over dry and saturated vapour compression refrigeration cycle.

- (f) What do you understand by hermetic sealed compressor ? State any three advantages of it.
- (g) Explain the working of air cooled condenser with neat sketch.

**2. Attempt any FOUR of the following :**

**4 × 4 = 16**

- (a) Draw a neat labelled sketch of vortex tube refrigeration & explain its working.
- (b) State any eight desirable properties of refrigerants.
- (c) Represent reversed Carnot cycle on P-V and T-S diagram and name various processes involved in the cycle.
- (d) What is dry and wet compression ? State the effects of wet compression on compressor of vapour compression refrigeration system ?
- (e) State any two difference between simple and practical aqua ammonia vapour absorption refrigeration system.
- (f) Draw a neat labelled sketch of automatic expansion valve.

**3. Attempt any TWO of the following :**

**16**

- (a) (i) State function of expansion device used in refrigeration system. List different types of expansion devices used in refrigeration system.
- (ii) Define and explain the term 'capacity of evaporator'.
- (b) Temperature limits of ammonia vapour compression refrigeration system are 25 °C and -10 °C. If refrigerant is dry at the end of compression, find C.O.P. There is no under cooling. Use following properties of ammonia.

T °C	$h_f$	$h_{fg}$	$S_f$	$S_{fg}$
	kJ/kg	kJ/kg	$\frac{\text{kJ}}{\text{kg } ^\circ\text{K}}$	kJ/kg K
25	298.9	1166.94	1.1242	3.9159
-10	135.37	1297.68	0.5443	4.9341

- (c) What is function of humidifier ? State different type of humidifier used in air conditioning. Explain the revolving wicks type humidifier with neat sketch.

**4. Attempt any FOUR of the following :****4 × 4 = 16**

- (a) Explain working of air washer with neat sketch.
- (b) What is sensible heating of air ? Represent sensible heating process on psychrometric chart.
- (c) Explain factors affecting human comfort.
- (d) Enlist any four types of duct materials used in air conditioning. State any four desirable properties of duct material.
- (e) Classify the fans used in air conditioning.
- (f) State four desirable properties of insulating materials used in air conditioning.

**5. Attempt any FOUR of the following :****4 × 4 = 16**

- (a) Describe working of centrifugal compressor with neat sketch.
- (b) Explain working of evaporative type condenser.
- (c) Classify the chillers and state their applications.
- (d) Explain working of domestic refrigerator with neat sketch.
- (e) Name the refrigerants used for the following
  - (i) Air conditioner
  - (ii) Domestic refrigerator
  - (iii) Ice plant
  - (iv) Water cooler
- (f) Enlist any four industrial applications of refrigeration and air conditioning and explain any one in short.

**P.T.O.**

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

- (a) With the help of psychrometric chart, find the following properties of air if air at  $26^{\circ}$  DBT and 60% relative humidity.
- (i) Dew point temp.
  - (ii) Wet bulb temp.
  - (iii) Specific volume
  - (iv) Enthalpy of air
  - (v) Specific humidity
- (b) Define sensible heat and latent heat gains. List the components of sensible and latent heat gain.
- (c) Explain winter air conditioning system with neat sketch for cold and dry outdoor conditions.
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