12246

15116

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

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 Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(7) Use of Steam tables, logarithmic, Mollier's chart is permitted.

(8) Use of psychrometric chart is permitted.

Marks

1. a) **Attempt any THREE of the following:**   **12**

(i) Define:

1) one ton of refrigeration

2) coefficient of performance (COP)

(ii) Compare vapour compression refrigeration system with vapour absorption refrigeration system. (Any four points)

(iii) Represent Bell Coleman air refrigeration cycle on P-V and T-S diagram. Label the processes.

(iv) Explain working principle of Vortex tube refrigeration with neat sketch.

Marks

b) **Attempt any ONE of the following:** 6

   (i) Draw a neat diagram of lithium bromide water absorption system and explain its working.

   (ii) Explain the working of flooded type evaporator with neat sketch.

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

   a) The NH_3 refrigeration system works on VCR cycle. The refrigerant is subcooled by $3\,°C$ before expansion and superheated by $15\,°C$ before it enters the compressor. Show the cycle on P-H and T-S chart. Calculate the COP and power required per kg of refrigerant circulated per minute.

   Use following enthalpy values:

   enthalpy at compressor inlet = 1460 KJ/kg

   enthalpy at compressor outlet = 1796 KJ/kg

   enthalpy at inlet to expansion valve = 322 KJ/kg

   b) What are the selection criteria for:

   (i) compressor and expansion device in a domestic refrigerator

   (ii) condenser and evaporator in ice plant.

   c) Draw a actual VCR cycle on T-S chart. Explain how it deviates from standard VCR cycle.

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

   a) Draw neat sketch of steam jet refrigeration. State principle of working.

   b) What are the desirable properties of an ideal refrigerant?

   c) State any four applications of refrigeration systems.

   d) How refrigerants are designated? Explain with suitable example.

   e) Draw a neat sketch of evaporative condenser. State principle of working.

Marks

4. a) **Attempt any THREE of the following:** **12**

    (i) What is "Eco-friendly refrigerant"? Name any two ecofriendly refrigerants.

    (ii) What is hermetically sealed compressor? State its any two advantages.

    (iii) Define:

        1) DBT

        2) DPT

        3) Relative humidity

        4) WBT

    (iv) Draw a neat sketch of loop perimeter duct system.

    b) **Attempt any ONE of the following:** **6**

    (i) Enlist four filters used in air conditioning. Describe the working of electronic filter.

    (ii) Explain the working of summer air conditioning for hot and wet weather with neat sketch.

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

    a) Explain with neat sketch, the working of thermostatic expansion valve.

    b) Atmospheric air with DBT of 28 °C and WBT of 17 °C is cooled to 15 °C without changing its moisture content. Find:

    (i) original relative humidity

    (ii) final relative humidity

    (iii) final wet bulb temperature

    (iv) enthalpy of final condition

    c) List any four sensible heat gain and latent heat gain sources considered for cooling load calculations.

Marks

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

 a) Explain in brief the factors affecting human comfort.

 b) Classify the air conditioning system on the basis of season, purpose and equipment arrangements.

 c) State functions of:

  (i) Diffusers

  (ii) Grills

 d) Explain the working of window air conditioning system with neat sketch.

 e) State any four types of insulating materials with one example each.

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