C. U. SHAH UNIVERSITY
Summer Examination-2020

Subject Name: Refrigeration and Air Conditioning

Subject Code: 4TE07RAC1   **Branch: B.Tech (Mechanical)**

Semester : 7   Date : 03/03/2020   Time : 10:30 To 01:30   Marks :70
Instructions:
  (1) Use of Programmable calculator & any other electronic instrument is prohibited.
  (2) Instructions written on main answer book are strictly to be obeyed.
  (3) Draw neat diagrams and figures (if necessary) at right places.
  (4) Assume suitable data if needed.

Q-1   **Attempt the following questions:**   **(14)**

  a) An Electrolux refrigerator is called
      (a) Single fluid absorption system (b) Two fluid absorption system
      (c) Five fluid absorption system(d) None of the above
  b) Flooded evaporator has to be fitted with
      (a) Accumulator (b) Float valve (c) Liquid eliminator (d) All of the above
  c) The sub cooling in a refrigeration cycle
      (a) does not alter C.O.P. (b) increases C.O.P. (c) decreases C.O.P. (d) none of these
  d) The highest thermal diffusivity is of
      (a) Iron (b) Wood (c) Concrete (d) Lead
  e) The optimum effective temperature for human comfort is
      (a) lower in winter than in summer (b) higher in winter than in summer
      (c) lower in winter and summer (d) not dependent on season
  f) The sub cooling is a process of cooling the refrigerant in VCRS
      (a) Before compression (b) After compression (c) Before throttling (d) After throttling
  g) While designing the refrigeration system of an aircraft, the prime consideration is that the
      (a) system has high C.O.P. (b) mass of the refrigeration equipment is low
      (c) power per TR is low (d) mass of refrigerant circulated in the system is low
  h) The humidity ratio or specific humidity is the mass of water vapour present in
      (a) 1 m^3 of wet air (b) 1 m3 of dry air (c) 1 kg of dry air (d) 1 kg of wet air
  i) In a psychometric process, the sensible heat added is 30 kJ/s and the latent heat added is 20 kJ/s. The sensible heat factor for the process will be
      (a) 0.3 (b) 0.6 (c) 0.67 (d)1.05
  j) In an all-air system of central air conditioning
      (a) The refrigeration plant and air treatment plants may be remotely located in central station apparatus
      (b) Cooling medium or heating medium is air and is sent through the ducts and distributed into conditioned space through outlet or mixing terminals
      (c) Both (a) and (b) are true

(d) None of the above is true

k) The temperature of ammonia after compression in a vapour compression system is

(a) 20 to 50° C (b) 50 to 70° C (c) 70 to 110° C (d) none of these

l) In a domestic vapour compression refrigerator the refrigerant used is

(a) CO_2 (b) Freon-12 (c) Ammonia (d) All of the above

m) Work of compression of the fluid in vapour absorption system of refrigeration as compared to that in vapour compression refrigeration system is

(a) More (b) Less (c) May be more or less (d) Un-predictable

n) Heat rejected by the refrigerant during vapour compression refrigeration cycle in

(a) Condenser (b) Evaporator (c) Compressor (d) Throttle Valve

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**

a) Discuss Bell column cycle with the help of P-V and T-s diagram?   **07**

b) Explain with neat sketch the working principle of boot-strap air refrigeration system with T-S diagram?   **07**

Q-3   **Attempt all questions**

a) (i) What is sensible heat gain and latent heat gain?   **07**

(ii) List the sources of sensible and latent heat gain in a restaurant?

b) Explain the concept of sensible heat factor and bypass factor with suitable sketch?   **07**

Q-4   **Attempt all questions**

a) Give the name of different methods to improve simple saturation cycle and explain any one with neat sketch.   **07**

b) The humidity ratio of atmospheric air at 28 °C dry bulb temperature and 760 mm of Hg is 0.016 Kg per Kg of dry air. Determine: **07**

    1. Partial pressure of water vapour
    2. Relative humidity
    3. Dew point Temperature
    4. Specific enthalpy
    5. Vapour Density

Q-5   **Attempt all questions**

a) Describe actual vapour compression refrigeration cycle with neat diagram.   **07**

b) A refrigeration system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 45° C and the lower temp is - 20°C. The capacity is to be 12 TR. Neglect all the losses. Determine: **07**

(i) C.O.P. (ii) Heat rejected from the system per hour (iii) Power required

Q-6   **Attempt all questions**

a) Draw a labeled sketch and explain working of window air conditioning system?   **07**

b) Explain the thermal exchange mechanism of human body with environment?   **07**

Q-7   **Attempt all questions**

a) What are different methods used for design of the ducts and explain advantages of each over other.   **07**

b) A rectangular section 40×40 cm size made of sheet metal is used to carry 100 m^3/min of air having a density of 1.2 kg/m^3. Find the equipment diameter of circular duct if   **07**

(a) Quantity carried if same in both the cases,

(b) If the same velocity in both cases if same.

Also find the pressure loss per 100-meter length of duct.

Take f = 0.015 for sheet metal.

Q-8   **Attempt all questions**
a) Explain in with a neat sketch a hermetically sealed compressor?   **07**
b) Explain with neat sketch Electrolux refrigeration system?   **07**