Printed Pages : 6

EME604

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 140603

Roll No. ☐☐☐☐☐☐☐☐☐☐

B. Tech.

(SEM. VI) THEORY EXAMINATION 2014-15
REFRIGERATION & AIR CONDITIONING

Time : **3 Hours]** [Total Marks : **100**

Note : Be precise and scientific in writing.

1 Attempt any **four** of the following : 4×5=20

   (a) Define the terms, "Refrigerating effect" unit of refrigeration and "C.O.P" as related to refrigeration system.

   (b) A refrigeration system is working on reversed Carnot cycle higher and lower temperatures of 40°C and -30°C respectively. Determine its C.O.P. it is desired to increase the C.O.P of the cycle to 4.75 by changing the temperatures of the cycle. If the increase (or decreased) in higher temperature is equal to the decrease (or increase) in lower temperature, calculate the new temperatures of the cycle.

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(c) Derive an expression for C.O.P of an air refrigeration system working on Bell-Coleman cycle, with the help of (P-V) and (T-S) diagram.

(d) Although the C.O.P of an air refrigeration cycle is very low, even then it is commonly used in aircraft refrigeration. Explain the reason.

(e) Enumerate the classification of air craft refrigeration system and differentiate between simple aircraft refrigeration system and a Boot strap refrigeration system. What do you understand by Dry Rated Temperature (DART)?

(f) What is the effect of change in Suction pressure in vapour compression refrigeration system?

2 Attempt any **two** of the following :   2×10=20

(a) With the help of P-H diagram, show the effect of (i) subcooling of condensate (ii) superheating of refrigerant vapours a simple vapour compression refrigeration system. Which of the above parameters are used to improve the C.O.P of the cycle.

(b) The condenser and evaporator temperatures of a 20 T capacity, simple saturated vapour compression refrigeration system, are 40°C and -20°C respectively. The refrigerant used in the system is R-22 Draw the cycle on P-H diagram (assuming isentropic compression) and calculate (a) the mass of refrigerant to be circulated (b) power required in the compressor and (c) the C.O.P of the cycle " If the system employs 5°C subcooling of refrigerant liquid and a superheating of 10°C of refrigerant vapour, what will be the new C.O.P of the cycle? Whether it will increase or decrease?"

(c) What is the significance of multistage vapour compression system and what are its advantages over simple vapour compression system? Also explain the purpose of flash gas removal and flash intercooler in multistage compression system.

3   Attempt any **two** of the following :   2x10=20

(a) With the help of a neat sketch, explain in brief, the working principle of a continuous Vapour Absorption Refrigeration system, obtaining an expression for maximum C.O.P of the cycle . Also determine the C.O.P of a Vapour Absorption system having a Generator temperature of 1100°C, evaporator temperature of -15°C and absorber/ condenser temperature of 40°C.

(b) A stream of 15 kg/s of aqua ammonia having concentration of 0.8 and a pressure of 5 bar mixes with another saturated liquid stream with flow rate of 10kg/s at 100°C at the same pressure. During mixing it receives heat the rate of 4000 kj/s.Obtain mixture concentration enthalpy, and amount of liquid and vapour after mixing.

(c) With the help of a neat sketch, Describe the working principle of a Practical Ammonia-water vapour absorption system of refrigeration.

4   Attempt any **two** of the following :   2×10=20

(a) What is the importance of Psychometric chart and how different Psychometric processes are represented on it? Draw the following process on a Psychometric chart describing them in brief.

  (i) Sensible heating and cooling

        (ii)   Latent heating and cooling i.e. humidification and dehumidification.

        (iii)   Heating and humidification.

   (b)   Room Air having a Dry bulb temperature of 40°C and wet bulb temperature of 25°C is cooled through sensible cooling process up to a temperature of 25°C. Show it on a Psychometric chart and determine the amount of heat removed (in kj/kg of d.a).

   (c)   As related to air conditioning, write short notes on the following :

        (i)   Thermal analysis of human body

        (ii)   Effective temperature and comfort.

5   Attempt any **two** of the following :   **2×10=20**

   (a)   Which are the important equipments being used in refrigeration and air-Conditioning systems? Describe the basic function and significance of each equipment, in brief.

   (b)   What is the basic difference between the requirements for Comfort and Industrial air conditioning? Explain in brief, the factor affecting Comfort air conditioning.

   (c)   What are the advantages of 'Food Preservation' ? Explain in brief, how refrigerators and freezers are used for preservation.

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