No. of Printed Pages : 5 00621 BIME-015

B.Tech. - VIEP - MECHANICAL ENGINEERING

(BTMEVI)

Term-End Examination, 2019

BIME-015 : REFRIGERATION AND AIR CONDITIONING

Time : 3 Hours] **[Maximum Marks : 70**

Note : Attempt **any seven** questions. **All** questions **carry equal** marks. Use of steam table, Refrigeration chart, Psychrometric chart is permitted. Use of scientific calculator is permitted.

---

1. (a) What do you understand by dry bulb and wet bulb temperature ? [5]

   (b) A refrigeration plant for a food store operates as a reversed Carnot heat engine cycle. The store is to be maintained at a temperature of -5°C and the heat transfer from the store to the cycle is at the rate of 5 kW, if heat is transferred from the

cycle to the atmosphere at a temperature of -25°C, calculate the power required to drive the plant. [5]

2. (a) Why does the enthalpy of an air-vapour mixture remain constant during an adiabatic saturation process ? [5]

(b) What is refrigerating effect ? What is a tonne of refrigeration ? [5]

3. An air-water vapour mixture enters an adiabatic saturator at 30°C and leaves at 20°C, which is the adiabatic saturation temperature. The pressure remains constant at 100 kPa. Determine the relative humidity and the humidity ratio of the inlet mixture. [10]

4. In a standard vapour compression refrigeration cycle, operating between an evaporator temperature of -10°C and a condensor temperature of 40°C, the enthalpy of the refrigerant, Freon -12, at the end of compression is 220 kJ/kg. Show the cycle diagram on T-S plane. [10]

Calculate :

(i) The COP of the cycle.

(ii) The refrigerating capacity and the compressor power

assuming a refrigerant flow rate of 1 kg/min. You may use the extract of Freon -12 property table given below :

$t(^0C)$	p (MPa)	h_f[kJ/kg]	hg(kJ/kg)
-10	0.2191	26.85	183.1
40	0.9607	74.53	203.1

5. (a) Explain the effect of superheat and subcooling on the vapour compression refrigeration cycle. [5]

(b) What are the parameters to be considered in the selection of a refrigerant ? [5]

6. (a) What is an absorption refrigeration cycle ? How does it differ from a vapour compression cycle ? [5]

(b) Derive the expression for the maximum COP of a vapour absorption refrigeration system. [5]

7. (a) A refrigerating system operates on the reversed carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is -15°C. The capacity is to be 12 tonnes. Determine : [5]

(i) Co-efficient of performance

(ii) Heat rejected from the system per hour

(iii) Power required

(b) What is a cooling tower ? How is it specified ? Where is it used ? [5]

8. (a) A reversed Carnot cycle has refrigerating COP of 4. [5]

(i) Determine the ratio $\frac{T_1}{T_2}$; and

(ii) If this cycle is used as heat pump, determine the COP and heat delivered.

(b) A simple vapour compression refrigeration plant produces 5 tonnes of refrigeration. The enthalpy values at inlet to compressor, at exit from the compressor, and at exit from the condensor are 183.19 kJ/kg, 209.41 kJ/kg, and 74.59 kJ/kg, respectively. Determine : [5]

(i) The refrigerant flow rate

(ii) The COP

(iii) The power required to drive the compressor

(iv) The rate of heat rejection to the condensor

9. (a) How are air-conditioning equipment classified ? Describe briefly with a neat sketch a window type air-conditioner. [5]

(b) State the advantages of central air-conditioning system over unitary system of air-conditioning.[5]

10. Write short notes on **any four** of the following :[4×2½=10]

(a) Dew Point

(b) Steam Ejector Refrigeration

(c) Thermostats

(d) Alternate Eco-friendly Refrigerant

(e) Ice-refrigeration

(f) Thermo-electric refrigeration system

----- x -----