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BME-032(S)

DIPLOMA IN MECHANICAL ENGINEERING (DME) / ADVANCED LEVEL CERTIFICATE COURSE IN MECHANICAL ENGINEERING (DMEVI / ACMEVI)

00418

Term-End Examination

December, 2016

BME-032(S) : REFRIGERATION AND AIR-CONDITIONING

Time : 2 hours *Maximum Marks : 70*

Note : *Answer **five** questions in all. Question no. 1 is **compulsory**. Assume missing data suitably. Use of scientific calculator is permitted.*

1. Select the correct answer from the given four alternatives for the following questions : *7×2=14*

   (a) The coefficient of performance of a refrigerator working on Carnot cycle is

   (i) $\frac{T_1 - T_2}{T_1}$

   (ii) $\frac{T_1 - T_2}{T_2}$

   (iii) $\frac{T_2}{T_1 - T_2}$

   (iv) $\frac{T_1}{T_1 - T_2}$

   where T_1 and T_2 are the highest and lowest operating temperatures in the cycle.

(b) In a one ton capacity water cooler, water enters at 30°C at the rate of 200 litres per hour. Taking specific heat of water at 4·16 kJ/kg K, the outlet temperature of water will be

(i) 3·5°C

(ii) 6·3°C

(iii) 23·7°C

(iv) 15°C

(c) An ideal refrigerator is operating between a condenser temperature of – 37°C and an evaporator temperature of – 3°C. If the machine is functioning as a heat pump, its coefficient of performance will be

(i) 6·00

(ii) 6·75

(iii) 7·75

(iv) 8·75

(d) Air refrigeration cycle is generally employed in

(i) Domestic refrigerators

(ii) Commercial refrigerators

(iii) Air-conditioning

(iv) Gas liquefaction

(e) On a psychrometric chart, the constant wet bulb temperature lines coincide with

(i) constant relative humidity lines

(ii) constant enthalpy lines

(iii) constant dew point temperature lines

(iv) constant volume lines

(f) Effective temperature depends upon dry bulb temperature and

(i) wet bulb temperature

(ii) relative humidity

(iii) specific humidity

(iv) wet bulb temperature and air motion

(g) In a window air-conditioner, the expansion device used is

(i) capillary tube

(ii) thermostatic expansion valve

(iii) float valve

(iv) automatic expansion valve

2. (a) Explain the concepts of food freezing, storage conditions and distribution.

(b) What are the various factors which contribute to food spoilage ? List the causes of food spoilage. 7+7

3. (a) Sketch a vapour absorption refrigeration cycle and mark its necessary components.

(b) Differentiate between centrifugal and rotary compressors. Also state their applications. 7+7

4. (a) What are the different types of condensers used in a refrigeration system ? Explain the working of any one condenser.

(b) What are the different types of evaporators ? Explain any one type of evaporator. 7+7

5. (a) With the help of a psychrometric chart, distinguish between specific humidity and relative humidity.

(b) State the factors considered while selecting an air-conditioning system. 7+7

6. (a) A refrigeration system produces 40 kg/hr of ice at 0°C from water at 26°C. Find the refrigeration effect per hour and TR. If it consumes 1·25 kW of energy to produce the ice, find the COP. Take latent heat of solidification of water at 0°C as 335 kJ/kg and specific heat of water as 4·19 kJ/kg °C.

(b) Describe the desirable thermodynamic properties of refrigerants. 8+6