| BIMEE-032(S) |

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

June, 2017

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BIMEE-032(S) : REFRIGERATION SYSTEMS

Time : 2 hours   *Maximum Marks : 70*

Note : *Answer any **five** questions. Question no. **1** is **compulsory**. All questions carry equal marks. Use of scientific calculator is permitted.*

1. Choose the correct answer from the given four alternatives :   *7×2=14*

   (a) If the thermal efficiency of a Carnot engine is $\frac{1}{5}$, the COP of a Carnot refrigerator is

       (i)   5

       (ii)   4

       (iii) 6

       (iv) 3

   (b) A humidification process means a/an

       (i)   decrease in relative humidity

       (ii)   increase in specific humidity

       (iii) decrease in temperature

       (iv) increase in temperature

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

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

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

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

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

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

(d) Air refrigeration cycle is generally employed in
(i) Domestic refrigerators
(ii) Commercial refrigerators
(iii) Air-conditioning
(iv) Gas liquefaction

(e) Wet compression is not desirable in a vapour compression system
(i) because it decreases COP
(ii) to prevent liquid refrigerant entering the compressor
(iii) to avoid flooding of evaporator
(iv) because it increases the compressor's work

(f) A Carnot heat pump supplies heat at 30°C and absorbs heat at − 10°C. It consumes 1 kW power. It will supply heat at a rate of

(i) 6·575 kW

(ii) 0·75 kW

(iii) 7·575 kW

(iv) None of the above

(g) Which is the process for summer air-conditioning ?

(i) Cooling and dehumidification

(ii) Cooling and humidification

(iii) Sensible cooling

(iv) Cooling along constant WBT line

2. Describe the vapour compression refrigeration system with the help of a neat block diagram. *14*

3. An ice plant operates between 35°C and − 15°C temperature limits. It produces 10,000 kg of ice per day from water at 30°C to ice at − 5°C. Assuming that the plant operates at a COP of 0·8 times the Carnot COP, calculate

(a) the capacity of the plant in tons,

(b) the Carnot COP and actual COP of the plant, and

(c) the power consumption in kW.

Given : Specific heat of water = 4·19 kJ/(kg-K)
Latent heat of fusion of ice = 335 kJ/kg
Specific heat of ice = 1·94 kJ/(kg-K) *14*

4. Explain the working of a simple vapour absorption refrigeration system with the help of a neat sketch. *14*

5. Differentiate between centrifugal and rotary compressors. Also list their applications. *14*

6. With the help of a psychrometric chart, distinguish between specific humidity and relative humidity. *14*

7. What is a multistage vapour compression plant ? Where is it used ? *14*

8. What is refrigeration ? How are (a) ice, and (b) dry ice used for the purpose of refrigeration ? *7+7*