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BIMEE-032

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

00486

June, 2015

BIMEE-032 : REFRIGERATION SYSTEMS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. (a) Derive a relation between the C.O.P. of the heat pump and C.O.P of the refrigerator. 7

(b) What is meant by dry and wet compression ? Which is preferred ? Give justification to your answer. 7

2. (a) State the merits and demerits of 'Vapour compression system' over 'Air refrigeration system'. 7

(b) What are the different types of Evaporators ? Explain in short any type of Evaporator. 7

3. (a) Ice is formed at 0°C from water at 20°C. The temperature of the brine is –10°C. Find the mass of ice formed per 1 kWh. Assume the refrigeration cycle as perfect reversible Carnot cycle. Latent heat of ice = 336 kJ/kg. 7

(b) A Carnot refrigerator extracts 400 kJ of heat per minute from a cold room which is maintained at –15°C and it is discharged to the atmosphere which is at 30°C. Find the capacity of the motor required to run the unit. 7

4. A refrigerator using NH_3 works between the temperatures –10°C and 25°C. The gas is dry at the end of compression and there is no undercooling of liquid. Calculate the theoretical C.O.P. of the cycle. The properties of NH_3 are given below : *14*

Temperature °C	Liquid Heat h_f (kJ/kg)	Latent Heat h_{fg} (kJ/kg)	Liquid Entropy S_f (kJ/kg)
25	100·8	1234·8	0·349
– 10	– 33·7	1352·5	– 0·139

5. In an absorption type refrigerator, the heat is supplied to NH_3 generator by condensing steam at 2 bar and 90% dry. The temperature to be maintained in the refrigerator is –5°C. The temperature of the atmosphere is 30°C. Find the maximum C.O.P. possible of the refrigerator. *14*

6. 1 kg of air at a pressure of 1·05 bar and a temperature of 20°C is compressed to 6 bar. It is then cooled to 27°C in the cooler before entering the expansion cylinder. Assuming compression and expansion as isentropic processes, determine

(i) Refrigerating effect per kg of air,

(ii) Theoretical C.O.P.

Take C_p = 1·0 kJ/kg K and γ = 1·4. *14*

7. Write short notes on any ***two*** of the following : *7+7*

(a) Bell-Coleman Cycle

(b) Working of an Ice Plant

(c) Reciprocating Compressors