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BIMEE-032

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

December, 2015

BIMEE-032 : 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 steam table and scientific calculator is permitted. Assume missing data suitably.*

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

(a) Which of the following does ***not*** change during a throttling process ?

(i) Enthalpy

(ii) Entropy

(iii) Volume

(iv) Pressure

(b) In an aircraft refrigeration system, the pressure at the cooling turbine outlet is equal to

(i) ambient pressure

(ii) cabin pressure

(iii) pressure at compressor inlet

(iv) None of the above

(c) In a refrigerator plant, if the condenser temperature increases, the power input to the compressor will

(i) decrease

(ii) increase

(iii) remain the same

(iv) be unpredictable

(d) In a vapour compression system, the working fluid is superheated vapour at entrance to

(i) evaporator

(ii) condenser

(iii) compressor

(iv) expansion valve

(e) When a liquid boils at constant pressure, the following parameter increases :

(i) Temperature

(ii) Latent heat of vaporization

(iii) Kinetic energy

(iv) Entropy

(f) In an ideal refrigeration (reversed Carnot) cycle, the condenser and evaporator temperature are 27°C and −13°C respectively. The COP of this cycle would be

(i) 6·5

(ii) 7·5

(iii) 10·5

(iv) 15·0

(g) The refrigerant used for absorption refrigerators working on heat from solar collectors is a mixture of water and

(i) Carbon dioxide

(ii) Sulphur dioxide

(iii) Lithium bromide

(iv) Freon-12

2. (a) Explain the working principle of vapour compression refrigeration system with the help of a block diagram.

(b) What are the effects of chlorofluorocarbons (CFCs) on the environment ? How do they affect the ozone layer ? 7+7

3. (a) Derive the expression for the maximum COP of a vapour absorption refrigeration system.

(b) Determine the ideal COP of an absorption refrigeration system in which the heating, cooling and refrigeration take place at 197°C, 17°C and –3°C respectively. *7+7*

4. (a) What is the difference between "Wet Compression" and "Dry Compression" ?

(b) Give the comparison between a vapour compression refrigeration system and vapour absorption refrigeration system. *7+7*

5. 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. Neglect all losses.

Determine : *14*

(a) Coefficient of performance

(b) Heat rejected from the system per hour

(c) Power required

6. Define the COP of a refrigerator. What is a heat pump ? How does it differ from a refrigerator ? Also derive the relation of COP between Heat Pump and Refrigerator. *14*

7. (a) State and explain the Clausius' statement of the second law of thermodynamics.

(b) Show that $\oint \frac{dQ}{T} = 0$ for a reversible cycle. *7+7*

8. Write short notes on any ***two*** of the following : *2×7=14*

(a) Properties of refrigerants

(b) Effect of superheating on the performance of vapour compression refrigeration system

(c) Expansion valve

(d) Defrosting