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MMTP - 203

M.E./M.Tech., II Semester

Examination, December 2014

Advance Refrigeration Systems

Time : Three Hours

Maximum Marks : 70

Note: Attempt any five questions. Use of refrigerant tables and charts is permitted.

1. a) Explain the international system used for designation of refrigerants. 7

   b) A vapour compression refrigeration machine with R-12 as refrigerant. has a capacity of 20 TR operating between –28°C and 26°C. The refrigerant is subcooled by 4°C before entering the expansion valve and the vapour is superheated by 5°C before leaving the evaporator. The machine has a six-cylinder single-acting compressor with stroke equal to 1.25 times the bore. It has a clearance of 3% of the stroke volume. The speed of the compressor is 1000 rpm. The specific heat of superheated vapour is 0.615 kJ/kg K and for the liquid is 0.963 kJ/kg K. Determine

   i) Theoretical power required

   ii) C.O.P

   iii) Volumetric efficiency and

   iv) Bore and stroke of the cylinder. 7

2. a) Give the thermodynamic and chemical requirements for the selection of a refrigerant. 7

   b) Calculate the power needed to compress 20 kg/min of R-12 from saturated vapour at 1.4 bar to a condensing pressure of 10 bar by two-stage compression with intercooling by liquid refrigerant at 4 bar. Assume saturated liquid to leave the condenser and dry saturated vapour to leave the evaporator. 7

3. a) Discuss briefly the capacity control of centrifugal compressor by

   i) Condenser water control system

   ii) Inlet vane control system and

   iii) Speed control system 7

   b) Discuss the purpose of the following in a refrigeration system.

   i) Oil separator and

   ii) Liquid subcooler 7

4. a) Compare the performance of reciprocating refrigerant compressors with that of centrifugal refrigerant compressors. with reference to variation in speed. variation in suction and condensing temperatures. 7

   b) Explain with the help of neat sketch an externally equalised thermostatic expansion valve. How is it different from internally equalised expansion valve? 7

5. a) Explain the working of evaporative condenser. Give its advantages and disadvantages over other. 7

   b) Explain the dry expansion evaporator with the help of a neat sketch. 7

6. a) What are the different types of heat transfer resistance in water cooled condensers? How is the total resistance related to the heat transfer? 7

   b) Explain the following methods of defrosting an evaporator:

      i) Pressure control defrosting

      ii) Temperature control defrosting and

      iii) Automatic hot gas defrosting 7

7. a) Explain the working of practical single-effect water-lithium bromide absorption chiller. 7

   b) Explain the working of the heat pump when used for the following purposes:

      i) Concentrating the juice and

      ii) Desalination of sea water. 7

8. a) Write a detailed note on refrigerant absorbent pair for a vapour absorption refrigeration system. 7

   b) Explain the working of solar powered refrigeration system. List its advantages and disadvantages. 7

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