Code No.: ME701PC | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
IV–B.TECH–I–Semester End Examinations (Regular) - November- 2023
REFRIGERATION AND AIR CONDITIONING
(MECH)

[Time: 3 Hours] [Max. Marks: 70]

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A (20 Marks)

1. a) Define Ton of Refrigeration. What is its value in SI system? [2M]
   b) What is the need of air conditioning of air craft's at high altitudes where ambient temperatures are very low? [2M]
   c) Explain the role of Throttle valve in VCR system. [2M]
   d) What are the essential components of vapour compression refrigeration system? [2M]
   e) What are the advantages and disadvantages of centrifugal compressors over reciprocating compressors? [2M]
   f) What are the points to be considered for selecting a condenser for refrigerating system? [2M]
   g) What are the parameters affecting the COP of VAR system? [2M]
   h) Name the working fluids employed in an Electrolux Vapor Absorption Refrigeration System. [2M]
   i) How does a latent heat load differ from a sensible heat load? [2M]
   j) Narrate the functions of grills in air-conditioning systems. [2M]

PART-B (50 Marks)

2. In a Bell-Coleman cycle of a refrigerator system, air is taken in at 1 bar and a temperature of -8^0C. The compression ratio maintained in the compressor is 4 by following the law of compression and expansion as PV1.2 = Constant. If the maximum temperature of the cycle is 25^0C, then find mean effective pressure, work required, net refrigerating effect and COP. [10M]

OR

3. A dense air refrigeration cycle operates between pressures of 4 bar and 16 bar. The air temperature after heat rejection to surroundings is 37^0C and air temperature at exit of refrigerator is 7^0C. The isentropic efficiencies of turbine and compressor are 0.85 and 0.8 respectively. Determine compressor and turbine work per TR; COP; and power per TR. Take Y=1.4 and Cp= 1.005 kJ/kg K. [10M]

4. Use p-h and T-s diagram and explain the actual cycle for the operation of vapour compression refrigeration system. [10M]

OR

5. A vapor compression works on a simple saturation cycle with R-12 as the refrigerant which operates between the condenser temperature of 40^0C and an evaporator temperature of -5^0C. For the modified cycle, the evaporator temperature is changed to -10^0C and other operating conditions are the same as the original cycle. Compare the power requirement for both cycles. Both systems develop 15 tonnes of refrigeration. [10M]

6. Explain the working of shell and coil, shell and tube evaporators used in vapour compression refrigeration system. [10M]

OR

7. Differentiate between Azeotropes and Zeotropes and discuss their importance with respect to Ozone depletion and global warming. [10M]

8. Describe the constructional and operational features of Li-Br vapour absorption refrigeration system. [10M]

OR

9. How does the Hilsch tube refrigeration system function? Explain by drawing the suitable line diagram. [10M]

10. How cooling and dehumidification process can be achieved in air conditioning system? Explain the processes on psychometric chart. [10M]

OR

11. Air at 30^0C DBT and 60% RH is passed over a cooling cum dehumidifying coil in a summer air-conditioning application. The volume flow rate of dry air is given to be 250 m3/min. The air leaves the coil at a DBT of 14^0C. If the bypass factor of the coil is 0.1, calculate (i) Dew point temperature of the coil, (ii) relative humidity of the conditioned air leaving the coil, (iii) capacity of the cooling coil in tons of refrigeration and (iv) sensible heat factor of the coil. [10M]

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