R13

B.Tech III Year II Semester (R13) Regular & Supplementary Examinations May/June 2017
REFRIGERATION & AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)
Use of refrigeration and air conditioning data hand book and steam tables are permitted in the examination hall.
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1   Answer the following: (10 X 02 = 20 Marks)
   (a)   Differentiate between a refrigerator and heat pump.
   (b)   State the principle of refrigeration.
   (c)   What is ODP and GWP?
   (d)   What happens during throttling?
   (e)   Why COP of vapour absorption system poorer than vapour compression system?
   (f)   List the advantages of thermoelectric refrigeration.
   (g)   What is the purpose of ventilation?
   (h)   Distinguish between sensible heat and latent heat.
   (i)   What is dehumidification?
   (j)   What are human comfort conditions?

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   An open cycle air refrigeration system working between 1 ata and 12 ata produces 25 tons of refrigeration. The temperature of air leaving the cooler is 298 K and temperature leaving the refrigerator is 273 K. Assuming the expansion and compression follow the law $PV^{1.35}$ = constant. Find: (i) Mass of air circulated per minute. (ii) COP of the system. (iii) HP per ton. (iv) Expander and compressor displacement.

OR

3   Discuss about the different methods of refrigeration.

UNIT – II

4   A vapour compression refrigeration machine with R-12 has 20 TR capacity operating between $-28°C\ and\ 26°C$. Refrigerant is subcooled by $4°C$ before entering expansion valve and is superheated by $5°C$ before leaving evaporator. The machine has 6 cylinders with stroke = 1.25 x bore. The clearance volume is 3% of stroke volume. Determine: (i) Theoretical power. (ii) COP. (iii) Volumetric efficiency. (iv) Bore and stroke. Speed of compressor = 1000 rpm. Cp$_{liquid}$ = 0.23 Kcal/kg$°K$. Cp$_{superheated\ vapour}$ = 0.147 Kcal/kg$°K$.

OR

5   How refrigerants are classified? Explain.

UNIT – III

6   Draw a neat line diagram of Electrolux refrigerator and explain its working principle. What is the important role of hydrogen in this refrigeration system?

OR

7   (a)   What is a Vortex tube? How does it work?
   (b)   Give applications of steam jet refrigeration.

UNIT – IV

8   Describe in detail the summer air conditioning system with a neat sketch.

OR

9   800 m^3/min of recirculated air at $22°C$ DBT and $10°C$ dew point temperature is to be mixed with 300 m^3/min of fresh air at $30°C$ DBT and 50% RH. Determine enthalpy, specific volume, humidity ratio and dew point temperature of the mixture.

UNIT – V

10   Explain the following:
   (a)   Comfort chart.
   (b)   Zone of comfort for year-round air conditioning.

OR

11   Suggest the different constructional features used in "heat pump" to improve the overall EPR.
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