

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.

- 1 Answer the following: (10 X 02 = 20 Marks)
- Differentiate between a refrigerator and heat pump.
 - State the principle of refrigeration.
 - What is ODP and GWP?
 - What happens during throttling?
 - Why COP of vapour absorption system poorer than vapour compression system?
 - List the advantages of thermoelectric refrigeration.
 - What is the purpose of ventilation?
 - Distinguish between sensible heat and latent heat.
 - What is dehumidification?
 - 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 $PV^{1.35} = \text{constant}$. 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 = $1.25 \times \text{bore}$. 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. $C_{p\text{liquid}} = 0.23 \text{ Kcal/kg}^{\circ}\text{K}$. $C_{p\text{superheated vapour}} = 0.147 \text{ Kcal/kg}^{\circ}\text{K}$.

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 $800 \text{ m}^3/\text{min}$ of recirculated air at 22°C DBT and 10°C dew point temperature is to be mixed with $300 \text{ m}^3/\text{min}$ 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 of “heat pump” to improve the overall EPR.
