

M.E. Second Semester (Mechanical Engineering (Thermal Engg.)) (New-CGS)

13516 : Advanced Refrigeration Engineerings : 2 MTE 2

P, Pages : 2

Time : Three Hours



AU - 3368

Max. Marks : 80

- Notes :
1. Answer **three** question from Section A and **three** question from Section B.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answer necessary with the help of neat sketches.
 4. Use of slide rule logarithmic tables, Steam tables, Mollier's Chart, Drawing instrument, Thermodynamic table for moist air, Psychrometric Charts and Refrigeration charts is permitted.

SECTION – A

1. a) Discuss the effect suction and discharge pressure suction vapour superheat and liquid subcooling in case of vapour compression system. 5
 - b) An air Conditioner operates in 40°C weather to keep a room at 20°C by withdrawing 12000 kJ/h of heat. Assuming that the evaporator and condenser have perfect heat conduction, that the cycle is an ideal dry compression cycle, and that the working is R-12, Determine the rate of heat rejected to the atmosphere the power required and the COP. Sketch the cycle on p-h and T-S diagrams. 8
 2. A compound refrigeration system using R-12 as refrigerant consists of three evaporators of capacities 20 TR at -5°C, 30 TR at 0°C and 10 TR at 5°C. The vapour leaving the evaporators are dry and saturated. The system is provided with multiple expansion valve and flash intercooler. The condenser temperature is 40°C and the liquid refrigerant leaving the condenser is sub-cooled to 30°C. Assuming isentropic compression at each stage. Find 13
 - a) The mass of refrigerant passing through each compressor.
 - b) The power required to drive the system.
 - c) COP of the system.
 3. a) What is the function of the following components in an absorption system. 8
 - i) Absorber,
 - ii) Rectifier
 - iii) Analyser
 - and iv) Heat exchangers
 - b) In an Ammonia-water absorption system is having following data: 6

The highest pressure (Generator and Condenser) = 16 bar.
Evaporator and absorber Pressure = 3 bar
The concentration of strong solution leaving the generator = 125°C
Capacity of the plant = 20 TR.
Calculate
 - i) COP
 - ii) Heat rejected in different components.
4. a) With a neat sketch explain the working of Lithium Bromide Absorption Refrigeration system. 6

- b) A lithium bromide – water absorption system incorporating a heat exchanger operates at the following temperatures,
 Generator temperature = 100°C
 Condenser temperature = 36°C
 Absorber temperature = 28°C
 Evaporator temperature = 10°C
 Mass flow rate delivered by the pump = 0.55 kg/sec
 Solution temperature entering the generator = 50°C.
 Calculate,
 a) The rates of heat transfer to or from the generators, the condenser the evaporator and the absorber
 b) The coefficient of performance of the cycle.

5. a) State the advantages, Disadvantages and applications of thermoelectric refrigeration system. 6
 b) Explain the neat sketch different components & their working in vortex tube. 7

SECTION – B

6. a) What are the desirable thermo-dynamic properties of refrigerant? Briefly discuss. 7
 b) Explain the designation system for refrigerants. 6
 7. a) State & explain the desirable physical properties of refrigerant. 7
 b) Why the most of the currently popular halo-carbon refrigerant are being phased out? 6
 8. a) State the detailed classification of Evaporators and explain with the neat sketch dry expansion Evaporator & plate evaporator. 10
 b) What points are considered in selecting a compressor for a refrigeration system. 4
 9. a) Classify the Expansion valve. Sketch and explain the working of thermostatic expansion valve. 7
 b) Describe with a neat sketch of a regenerative air cooling system and draw its T-S diagram. 6
 10. A simple air cooled system is used for an Aeroplane having a load of 10 tonnes. The atmospheric pressure and temperature are 0.9 bar and 10°C respectively. The pressure increases to 1.013 bar due to ramming. The temperature of the air is reduced by 50°C in the heat exchanger. The pressure in the cabin is 1.01 bar and the temperature of air leaving the cabin is 25°C. Determine, 13
 1) Power required to take the load of cooling in the cabin and
 2) COP of the system.
 Assume that all the expansions and compressions are isentropic. The pressure of the compressed air is 3.5 bar.
