

B.Tech. 7th Semester (Mechanical Engg.) VII
Examination, December-2013

REFRIGERATION AND AIR CONDITIONING

Paper-ME-403-F

Time allowed : 3 hours]

[Maximum marks : 100

Note : Q. No. 1 is compulsory. Attempt five questions in total, at least one from each section.

1. (a) Define the refrigeration. What is COP ? 5
- (b) What is Electrolux refrigeration ? 5
- (c) What is the use of psychrometric chart ? 5
- (d) What are different types of evaporators ? 5

Section-A

2. (a) What are various methods of refrigeration ? 10
- (b) Explain the working of Carnot refrigeration cycle with its limitations ? 10
3. A Carnot refrigerator extracts 500 kJ of heat per minute from a cold room which is maintained at -10°C and it is discharged to atmosphere which is at 35°C . Find the ideal power required to run the refrigerator. 20

Section-B

4. A three-stage ammonia refrigeration system with flash intercooling operates between the overall pressure limits of 2 bar and 12 bar. The flash intercooling pressures are 4 bar and 8 bar. The load on the evaporator is 10 tonnes of refrigeration. Find out :
- The power req. to run the system.
 - Compare the C.O.P. of the system with that of simple saturation cycle working between the same overall limits. 20
5. In an absorption type refrigerator, the heat is supplied to NH_3 generator by condensing steam at 2 bar and 88% dry. The temp. in the refrigerator is to be maintained at -4°C . Find the maximum C.O.P. possible. If the refrigeration load is 18 tonnes and actual C.O.P. is 72% of the maximum C.O.P., find the mass of steam req. per hour. Take the temp. of atmosphere as 25°C . 20

Section-C

6. Explain the following :
- Various properties of moist air.
 - Basic processes in conditioning of air. 20

7. In a space to be air-conditioned the heat gains are as follows :

Heat gains through wall, roof and floor = 10 kW
 occupancy : 40 persons each with 75 W sensible and 65 W latent heat load.

Lighting : 1.5 kW, ventilation : 0.33 m³/per min/per person in filtration : 150 m³/h.

Outdoor conditions : 43°C DBT and W = 0.017kg/kg of dry air

Indoor conditions : 25°C DBT and W = 0.01 kg/kg of dry air

$$QS = 0.0204 \times \text{cmm} \times \Delta t \text{ kW}$$

QL = 50 cmm \times ΔW kW. cmm is volume flow rate in m³/min. Find out : RSH₁, RLH₁, OASH₁ 20

Section-D

8. Explain the following :
- Equipment selection for air conditioning system
 - Design of summer air-conditioning. 20
9. Write short note on the following :
- Types of condensers
 - Types of compressors. 20