[Total No. of Questions: 09]

[Total No. of Pages: 03]

Uni. Roll No. ....

Program/ Course: B. Tech. (Batch 2018 Onward)
Semester: 6th
Name of Subject: Refrigeration and Air Conditioning
Subject Code: PCME-116
Paper ID: 17253
Scientific calculator is Allowed

EVENING

1 3 JUN 2023

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) **Part A** and **B** are **compulsory**.
2) **Part C** has Two Questions **Q8** and **Q9**. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.
4) **Refrigeration Table/Charts** are allowed to use.

Part- A

[Marks: 02 each]

Q1.

a) What is the meaning of 1 TR?
b) What is the difference between heat pump and refrigerator?
c) The capacity of a refrigerator is 200TR when working between -6°C and 25°C, find the power required to drive the unit.
d) Enlist any four components used in vapour compression refrigeration system.
e) What is the meaning of sensible heat factor?
f) Give any two examples of brines with their application.

Part- B

[Marks: 04 each]

Q2. Drive an expression for COP and power required for boot-strap air evaporative cooling system with detailed discussion. Also draw the line and T-s diagrams.

Q3. A simple air cooled system is used for an airplane having a load of 10 tonnes. The atmospheric pressure and temperature are 0.9 bar and 10°C respectively. The pressure increase to 1.013bar 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:
   i. The power required to take the load of cooling in the cabin.
   ii. COP of the system

Assume that all the expansion and compression are isentropic. The pressure of the compressed air is 3.5bar.

Q4. What are the desirable thermodynamic properties of refrigerants? Discuss in detail

Q5. A vapor compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under-cooling of the liquid before the expansion valve. Determine: 1. C.O.P. of the cycle; and 2. Capacity of the refrigerator if the fluid flow is at the rate of 5 kg/min.

P.T.O.

Cabin temperature = 25°C
Cabin pressure = 1 bar

Find: 1. Mass of air required to take the cabin load, 2. Power required for the refrigeration system, and 3. COP of the system.

Q9. (a) Draw line and p-h diagram for multiple evaporators at different temperatures with multiple compression and individual expansion valves. Also find out the total power required and COP of the system.

(b) How suction pressure and discharge pressure effect the vapor compression refrigeration cycle.

Or

(a) What are inorganic refrigerants? Discuss in detail the properties and application of each inorganic refrigerant.

(b) What is effective temperature? Discuss the factors that affect the optimum effective temperature.

****

EVENING

1 3 JUN 2023