

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2022 - 23 Examination

Semester: 7

Subject Code: 203109431

Subject Name: Refrigeration and Air Conditioning

Date: 08/10/2022

Time: 10:30 am to 01:00 pm

Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.
5. Use of refrigerant property table, psychrometric chart and duct friction chart are permitted.

Q.1 Objective Type Questions**(15)**

1. Write Chemical formula and Refrigerant number for Trichloro-monofluoro-methane.
2. Define bypass factor.
3. The coefficient of performance (COP) of a refrigerator working as a heat pump is given by:

a) $(COP)_{\text{heat pump}} = (COP)_{\text{refrigerator}} + 2$	b) $(COP)_{\text{heat pump}} = (COP)_{\text{refrigerator}} + 1$
c) $(COP)_{\text{heat pump}} = (COP)_{\text{refrigerator}} - 1$	d) $(COP)_{\text{heat pump}} = (COP)_{\text{refrigerator}}$
4. In VCRS, subcooling is used _____
 - a) to increase COP
 - b) to increase Refrigerating effect
 - c) both a and b
 - d) None of above
5. Define aspect ratio for rectangular duct.
6. _____ Refrigerant is most commonly used in ice plants.
7. A food Preservation is essential to store the food to
 - a) Prevent the food spoilage
 - b) make transportation and storage of food easier
 - c) Provide care of excess produced food.
 - d) All of the above
8. The heat load from the occupants in air conditioning load calculation is a source of:
 - a) latent heat only
 - b) sensible heat only
 - c) both sensible & latent heat
 - d) none of above
9. State the function of intercooling in compound compression refrigeration system.
10. Which refrigerant is used in air refrigeration system?
11. State the function of compressor.
12. A refrigerating machine having COP equal to 2 is used to remove heat at the rate of 1200 kJ/min. calculate the power required for the system.
13. The required inside design conditions for comfort air conditioning is generally taken as
 - a) 28°C & 70% RH
 - b) 26°C & 60% RH
 - c) 22°C & 80% RH
 - d) 30°C & 50% RH
14. Write C.O.P Equation for Vapour Absorption Refrigeration System.
15. Which one of the following is the most important function of thermostatic expansion valve?
 - a) To control the degree of superheat
 - b) To control the evaporator temperature
 - c) To control the pressure drop
 - d) To control the evaporator pressure

Q.2 Answer the following questions. (Attempt any three)**(15)**

- A) A refrigerator working on reverse brayton cycle operates between the pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 10°C, compressed and then it cools to 30°C before entering the expansion cylinder. The expansion cylinder. It follows $p v^{1.3} = \text{const}$. Determine theoretical COP of the system.
- B) State the Classification the refrigerant and Discuss thermodynamic properties of refrigerant.
- C) Discuss the application of industrial Air-conditioning.
- D) Explain the working of three – fluid Electrolux refrigeration system with neat sketch and

mentioned the function of each fluid.

Q.3 A) State the types of multi stage system and discuss two stage compression with water intercooler and liquid sub cooler with schematic and p-h diagram. (07)

B) Define air conditioning & Discuss the working of split air conditioner with neat sketch. (08)

OR

B) State the function of duct. Classify the duct and state the economic factors influence on duct layout. (08)

Q.4 A) Define psychrometry and explain in detail cooling and dehumidification process with the help of the diagram. (07)

OR

A) A VCERS working between pressure of 4.93 bar and 1.86 bar. The vapour is super-heated at the end of compression, its temperature is 25°C. The liquid is cooled 9°C before throttling. The vapour is 95% dry before compression. Using the data given below, Calculate the coefficient of performance and refrigerating effect per kg of working substance calculated: (07)

Pressure, bar	Saturation Temperature, °C	Hf (total heat of liquid) , kJ/kg	Hfg (latent heat)kJ/kJ
1.86	-15	21.67	161.41
4.93	14.45	49.07	147.8

The specific heat at constant pressure for the superheated vapour is 0.645kJ/kg K and for the liquid is 0.963 kJ/kgK.

B) Define human comfort and Explain factors affecting optimum effective temperature. (08)