



KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Agri. Engg.) 2023 & previous admissions
V Semester Final Examination – January 2026

Fape.3105

Refrigeration and Air Conditioning (2+1)

Marks: 50
Time: 2 hours

I Fill in the blanks (10x1=10)

1. The unit of COP (Coefficient of Performance) in refrigeration is
2. The principle of operation of a Bell-Coleman cycle is based on the cycle.
3. A is used to reduce the temperature of a substance in refrigeration systems.

Choose the correct answer

4. Which of the following is NOT a thermodynamic property?
 - (a) Pressure
 - (b) Temperature
 - (c) Work
 - (d) Enthalpy
5. In the Carnot cycle, the efficiency depends on which of the following?
 - (a) The temperature difference between the hot and cold reservoirs
 - (b) The type of working fluid
 - (c) The mechanical energy used
 - (d) None of the above

State True or False

6. The enthalpy of a system is the sum of its internal energy and the product of its pressure and volume.
7. A vapour absorption refrigeration system is more efficient than a vapour compression system in all cases.
8. In a refrigeration cycle, the compressor raises the temperature and pressure of the refrigerant.
9. Evaporative type of condensers are used in most of the Ammonia refrigeration plant.
10. When outside air is introduced for ventilation purpose, there is a sensible heat gain only.

II Write short notes on ANY FIVE of the following (5x2=10)

1. Explain the significance of the COP in refrigeration.
2. Differentiate between sensible heat and latent heat.
3. What are the basic components of a mechanical refrigeration system?
4. Define entropy and explain its role in the refrigeration cycle.
5. What is supercooling and subcooling?
6. Describe the working principle of the Electrolux refrigerator.
7. Explain the concept of the sensible heat factor in air conditioning.

III Answer ANY FIVE of the following (5x4=20)

1. Describe the working principle of an air refrigerator using the reversed Carnot cycle.
2. A vapour compression refrigeration system operates with refrigerant R-134a. The system has an evaporator temperature of 5°C and a condenser temperature of 40°C. The enthalpies at the evaporator inlet and outlet are 250 kJ/kg and 180 kJ/kg, respectively. The compressor work is 80 kJ/kg. Calculate:
 - (a) The COP of the system
 - (b) The refrigeration capacity if the mass flow rate is 0.1 kg/s
3. Explain the importance of P-V, P-S, and P-H diagrams in refrigeration.
4. What is the role of the expansion valve in a refrigeration cycle?

5. Discuss the advantages of the vapour absorption refrigeration system over the vapour compression system.
6. What are the common refrigerants used in refrigeration systems? List their properties.
7. A room is to be air-conditioned, and the following conditions are given:
 - Dry Bulb Temperature = 30°C
 - Wet Bulb Temperature = 20°C
 - Air flow rate = $0.5 \text{ m}^3/\text{s}$Using the psychrometric chart, calculate:
 - (a) The relative humidity of the air
 - (b) The specific volume of the air
 - (c) The enthalpy of the air

IV

Write an essay on ANY ONE of the following

(1x10=10)

1. A cold storage room is maintained at -5°C , and the external temperature is 30°C . The following are the given data:
 - The volume of the cold storage room = 200 m^3
 - The heat leakage into the room = $0.3 \text{ W/m}^2\text{C}$
 - The refrigeration system operates at an efficiency of 0.5.Calculate:
 - (a) The total heat load entering the cold storage room
 - (b) The required refrigeration capacity of the system
2. Describe the design of a cold storage plant. Include the calculations involved in determining the refrigeration capacity and the design considerations.
