



KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Agrl. Engg.) 2018 Admission

V Semester Final Examination – February 2021

Fape.3105

Refrigeration and Air Conditioning (2+1)

Marks: 50
Time: 2 hours

I Fill up the following (10x1=10)

1. _____ states the heat flows from a higher temperature to lower temperature irrespective of material and mass of the bodies through which heat transfer takes places.
2. In vapour compression refrigeration system, the condition of refrigerant before entering the compressor is _____.
3. Electrolux refrigerator is a _____ refrigerator.
4. Dichloro di flouro methane is represented as _____.
5. _____ is the process of removing heat from a space at a temperature lower than the surrounding temperature.

State True or False

6. In the pH chart, the saturated liquid is one which has a temperature equal to the saturation temperature corresponding to its pressure.
7. The simple air cooling system is good for high flight speeds.
8. Ammonia is a highly toxic and flammable refrigerant.
9. If relative humidity is 100%, then dry bulb temperature is greater than wet bulb temperature.
10. When the 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. What is meant by refrigeration effect?
2. Write a short note on Bell-Coleman cycle.
3. What are the advantages and disadvantages of vapour compression refrigeration system over air refrigeration system cycle?
4. Define Heat Rejection Factor of condenser.
5. Write about any two Azeotrope refrigerants.
6. Ambient air is available at 35°C dry bulb temperature and 55% RH using psychrometric chart. Find (i) humidity (ii) wet bulb temperature (iii) dew point temperature and (iv) enthalpy.
7. Why the ducts are used in an air conditioning system?

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

1. Differentiate between the entropy and enthalpy.
2. Distinguish between the Carnot cycle and reverse Carnot cycle.
3. Describe the mechanism of a simple vapour compression refrigeration system.
4. Give details about the working principles of domestic electrolux refrigerator.
5. Differentiate between thermal, physical and chemical properties of refrigerant (Any two for each property).
6. One kg of air at 40°C dry bulb temperature and 50% relative humidity is mixed with 2 kg of air at 20 °C dry bulb temperature and 20°C dew point temperature. Calculate temperature and specific humidity of the mixture.

7. List out the air conditioning system and briefly explain anyone of the air conditioning system.

IV Write an essay on ANY ONE of the following (1x10=10)

1. i) Give details about practical vapour absorption system. (5 Marks)

ii) In an absorption type refrigerator, the heat is supplied to NH₃ generator by condensing steam at 2 bar and 90% dry. The temperature in the refrigerator is to be maintained at -5°C. Find the maximum C.O.P possible. If the refrigeration load is 20 tonnes and actual C.O.P. is 70% of the maximum C.O.P. Find the mass of steam required per hour. Take temperature of the atmosphere as 30°C.

(5 Marks)

2. **Solve the following problem related to the cold storage.**

Eight tones of apple having specific heat of 0.80 kcal/kg °C is to be cooled from 25°C to 14°C in 24 hours. The heat of respiration per 24 hour is 745 kcal/t. Three men will work for 4 hours and lighting load is estimated to be 100 Watt. Air infiltration load is assumed as 980 kcal in 24 hours. The cold storage measures 6 x 6 x 3 m on the inside and is constructed of bricks laid in cement mortar. Wall thickness is 40 cm and there is 10 cm thick cork insulation on the inside of the four walls. The cement plaster is 1 cm thick. The heat transfer coefficient for the ceiling is 20% more than that for the walls. The outside temperature is 30°C and the inside is maintained at 5°C.

Calculate the plant capacity needed in tones of refrigeration.

Thermal conductivity of brick = 0.45 kcal/h/m°C, Thermal conductivity of cork = 0.025 kcal/h/m°C, Thermal conductivity of cement plaster = 0.25 kcal/h/m°C and heat of respiration for men = 170 kcal/h/m°C. There is no heat transfer through the floor.
