KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agrl. Engg.) 2020 Admission
V Semester Final Examination - January 2023

Fape.3105   **Refrigeration and Air Conditioning (2+1)**   **Marks: 50**
                                                                            Time: 2 hours

I   **Fill in the blanks**   **(10x1=10)**
1. One tonne of refrigeration is equal to…………. kJ/min.
2. The ratio of heat extracted in the refrigerator to the work done of the refrigerant is called………
3. Air refrigerator works on……………. cycle.
4. A reversed Carnot cycle has a COP of 4. The ratio of higher temperature to lower temperature will be……………….
5. During a refrigeration cycle, heat is rejected by the refrigerant in a……………….
6. The highest temperature during the cycle, in a vapour compression refrigeration system, occurs after………………
7. COP of vapour absorption system as compared to vapour compression system is…………….
8. In……………. air-conditioning, the air is cooled and dehumidified.
9. In a psychrometric process, the sensible heat is 30 KJ/s and the latent heat added is 20 KJ/s. The sensible heat factor will be……………...
10. Waste heat can be effectively used in ………………. refrigeration system.

II   **Write short notes on ANY FIVE of the following**   **(5x2=10)**
1. What is a standard rating of a refrigeration machine?
2. What is the difference between 'Wet compression' and 'Dry compression'?
3. For a vapour compression refrigeration machine, explain the effect of under-cooling and superheating on the coefficient of performance.
4. Sketch the T-S diagram for the vapour compression cycle, when the vapour after compression is dry and saturated.
5. Broadly classify the refrigerants.
6. What do you understand by the term 'psychrometry'?
7. Define room sensible heat factor.

III   **Answer ANY FIVE of the following**   **(5x4=20)**
1. Derive the COP of air refrigerator working on Bell-Coleman cycle.
2. A Carnot refrigeration cycle absorbs heat at 270K and rejects it at 300K.
   (a) Calculate the COP of this cycle.
   (b) If the cycle is absorbing 1130kJ/min at 270K, how much kJ of work is required per second?
   (c) If the Carnot heat pump operates between the same temperatures, as the above refrigeration cycle, what is the COP?
   (d) How many kJ/min the heat pump will deliver at 300K if it absorbs 1130kJ/min at 270K?
3. Draw a neat diagram of three fluid system of refrigeration (Electrolux refrigeration system) and explain its working.
4. Write short notes on R-12 and R-22 refrigerants.
5. Write short notes on comfort air conditioning.

6. In an ammonia vapour compression system, the pressure in the evaporator is 2 bar. Ammonina at exit is 0.85 dry and at entry its dryness fraction is 0.19. The work done per kg of ammonia during compression is 150 kJ. Calculate the C.O.P and the volume of vapour entering the compressor per minute if the rate of ammonia circulation is 4.5 kg/min. The latent heat and specific volume at 2 bar are 1325 kJ/kg and 0.58 m^3/kg respectively.

7. Define winter air conditioning system.

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

1. How does an actual vapour compression cycle differ from that of theoretical cycle?
2. State the difference between Vapour compression refrigeration system and Vapour absorption refrigeration system.

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