Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Refrigeration and Cold Chain **Semester: IV**
Program: B.Tech Food Technology **Time : 03 hrs.**
Course Code: MECH2038 **Max. Marks: 100**

Instructions: Attempt all questions

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q.1	A sling psychrometer gives reading of 25 ^{0}C dry bulb temperature 15 ^{0}C wet bulb temperature. The barometer indicates 760 mm of hg assuming partial pressure of the vapour as 10 mm of Hg. Determine 1. Specific humidity 2. Saturation ratio	**4**	**CO3**
Q.2	Enumerate some common methods being used for food preservation.	**4**	**CO1**
Q.3	Explain By Pass Factor (BPF) and Apparatus Dew Point (ADP) temperature using Psychometry chart.	**4**	**CO1**
Q.4	Comment on number of chlorine atom and Ozone depletion potential of R11 refrigerant?	**4**	**CO2**
Q.5	Explain the benefits and limitations of Controlled Atmosphere and Modified Atmosphere for fruits and vegetables.	**4**	**CO1**
	SECTION B **(4Qx10M= 40 Marks)**		
Q.6	Explain the Freezing curve of water and Binary fluid. Illustrate super cooling and Thermal arrest using freezing curve	**10**	**CO2**
Q.7	Classify industrial equipment for freezing and discuss the importance of freezing as a preservation method	**10**	**CO1**
Q.8	Explain the principle of controlled atmosphere storage of cereals and oilseeds	**10**	**CO1**
Q.9	Discuss transmission load, Infiltration load, product load and Internal load.	**10**	**CO2**
	SECTION-C **(2Qx20M=40 Marks)**		
Q.10	A 100% outdoor summer air conditioning system has a room sensible heat load of 400 kW and a room latent heat load of 100 kW. The required inside conditions are 24 ^{0}C and 50% RH, and the outdoor design conditions are 34 ^{0}C and 40% RH. The air is supplied to the room at a dry bulb temperature of 14 ^{0}C. Find a) the required mass flow rate of air	**20**	**CO3**

	b) moisture content of supply air, c) Sensible, latent heat loads on the coil, and d) The required cooling capacity of the coil, Coil Sensible Heat Factor and coil ADP if the by-pass factor of the coil is 0.2. Barometric pressure = 1 atm. Comment on the results. ***OR*** The table provides steady-state operating data for a vapor-compression refrigeration cycle using R-134a as the working fluid. **State** | **1** | **2s** | **2** | **3** | **4** ***h*** **(kJ/kg)** | **241.35** | **272.39** | **280.15** | **91.49** | **91.49** For a refrigerant mass flow rate of 0.08 kg/s, determine the a) compressor power, in kW, (b) refrigeration capacity, in tons, (c) coefficient of performance, (d) isentropic compressor efficiency		
Q.11	The chilling room of a meat plant is 15 m x 18 m x 5.5 m in size and has a capacity of 350 beef carcasses. The power consumed by the fans and the lights in the chilling room are 22 and 2 kW, respectively, and the room gains heat through its envelope at a rate of 14 kW. The average mass of beef carcasses is 220 kg. The carcasses enter the chilling room at 35 ^{0}C, after they are washed to facilitate evaporative cooling, and are cooled to 16 ^{0}C in 12 h. The air enters the chilling room at -2.2 ^{0}C and leaves at 0.5 ^{0}C. Determine (a) the refrigeration load of the chilling room and (b) the volume flow rate of air. The average specific heats of beef carcasses and air are 3.14 and 1.0 kJ/kg ^{0}C, respectively, and the density of air can be taken to be 1.28 kg/m^3.	**20**	**CO3**