Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II– EXAMINATION – WINTER - 2016

Subject Code: 2722109 **Date: 18/11/ 2016**

Subject Name: Advanced Refrigeration Engineering

Time: 2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks**

Q.1	**(a)**	What are azeotropic and non-azeotropic mixtures? Explain, in brief, their advantages giving examples.	**07**
	(b)	Explain the working of boot strap aircraft refrigeration system with a neat sketch and T-s diagram.	**07**
Q.2	**(a)**	Explain the working principle of automatic expansion valve with the help of a neat diagram.	**07**
	(b)	A simple air cooled system is used for an aeroplane having a load of 10 TR. The atmospheric pressure and temperature are 0.9 bar and 10°C respectively. During ramming pressure increases to 1.013 bar. In the heat exchanger, the temperature of air reduced by 50°C. The pressure in the cabin is 1.01 bar and the temperature of air leaving the cabin is 25°C. Determine: (i) power required to take the load of cooling in the cabin; and (ii) COP of the system. Assume that all the expansions and compressions are isentropic. The pressure of the compressed air is 3.5 bar.	**07**
		OR	
	(b)	Derive an expression for finding out the mass of motive steam required per kg of water vapour produced in a steam jet refrigeration system.	**07**
Q.3	**(a)**	Explain the differences between multi-stage refrigeration and cascade refrigeration system.	**07**
	(b)	In an ammonia system one evaporator is to provide 200 kW of refrigeration at -25℃ and another evaporator is to provide 100 kW at 7℃. The system uses two stage compressions with flash intercooling and also flash gas removal. The condensing temperature is 50 ℃. Calculate power required by the compressors.	**07**
		OR	
Q.3	**(a)**	Draw a schematic and p-h diagram of two –stage vapour compression system employed with flash intercooling and flash gas removal. Also discuss the steps to evaluate the COP of the said system.	**07**
	(b)	Explain the balancing of compressor and capillary tube in VCR system and effects of unbalanced conditions in compressor-capillary tube system	**07**
Q.4	**(a)**	Explain the working of double effect LiBr-H_2O absorption system along with a neat sketch and ln p -1/T diagram.	**07**
	(b)	A stream of 15 kg/s of aqua ammonia (c_1= 0.8) at 0℃ and 5 bar mixes adiabatically with another saturated liquid stream with the flow rate 10 kg/s and 100℃ at the same pressure. Establish the state points on h-c diagram and obtain mixture concentration, mixture enthalpy.	**07**
		OR	
Q.4	**(a)**	The following values refer to LiBr-H_2O absorption system without solution heat exchanger	**07**

Condensing Temperature = 40℃; Evaporator Temperature = 10℃

Absorber Temperature = 30°C; The Generator Temperature = 100°C
The enthalpy of the solution entering in to the generator is (-168 kJ/Kg) and leaving the generator is (-52 kJ/kg). Assume mass flow rate of solution entering the generator = 0.6 kg/s; entering to absorber = 0.452 kg/s and water vapor entering the condenser = 0.148 kg/s.
Compute q_g, q_a, q_c, q_e and the COP

(b) Explain the actual vapour absorption system (NH_3/H_2O) with neat schematic and its representation on enthalpy-composition diagram. **07**

Q.5 **(a)** Discuss typical examples of food processing by refrigeration. **07**

(b) Discuss various method of refrigeration adopted in refrigerated trucks and containers. **07**

OR

Q.5 **(a)** Explain in brief the various sources of heat and type of product load to be considered while making a cold storage design. **07**

(b) Explain the use of devices like side glass, filter dryer in a refrigeration system **07**

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