Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–II • EXAMINATION – SUMMER - 2017

Subject Code: 2722109 **Date: 26/05/2017**

Subject Name: Advanced Refrigeration Engineering

Time: 02:30 PM To 05:00 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)**	Explain Montreal and Kyoto Protocols and its implication on refrigeration and air conditioning industry.	**07**
	(b)	Explain the working of reduced ambient aircraft refrigeration system with a neat sketch and T-s diagram.	**07**
Q.2	**(a)**	Explain the working principle of thermostatic expansion valve with the help of a neat diagram.	**07**
	(b)	An aircraft moving with speed of 1000 km/h uses simple gas refrigeration cycle for air-conditioning. The ambient pressure and temperature are 0.35 bar and (-10℃) respectively. The pressure ratio of compressor is 4.5. The heat exchanger effectiveness is 0.95. The isentropic efficiency of compressor and expander are 0.8 each. The cabin pressure and temperature are 1.06 bar and 25℃. Determine temperatures and pressures at all points of the cycle. Also find the volume flow rate through compressor inlet and expander outlet for 100 TR. Take $Cp = 1.005$ kJ/kg K; $R = 0.287$ kJ/kg K and $\gamma = 1.4$ for air.	**07**
		OR	
	(b)	Explain with the help of neat sketch and also T-s and h-s diagram, the working of a steam jet refrigeration system	**07**
Q.3	**(a)**	What are the advantages of compound compression with intercooler over single stage compression?	**07**
	(b)	Explain with neat sketch and p-h diagram the VCR system which is having multiple evaporators at different temperatures with compound compression, multiple expansion valves and flash intercooler.	**07**
		OR	
Q.3	**(a)**	A two stage refrigerating system is operating between the pressure limits of 8 bar and 1.4 bar. The working fluid is R-134a. The refrigerant leaves the condenser as saturated liquid and is throttled to a flash chamber operating at 3.2 bar. The part of refrigerant evaporates during the flashing process and this vapor is mixed with the refrigerant leaving the low pressure compressor. The mixture is then compressed to the condenser pressure by the high pressure compressor. The liquid in the flash chamber is throttled to the evaporator pressure and cools the refrigerated space as it vaporizes in the evaporator. Assuming the refrigerant leaves the evaporator as saturated vapor and both compressions are isentropic, determine: 1. The fraction of refrigerant that evaporates as it is throttled to flash chamber; 2. The amount of heat removed from the refrigerated space and compressor work per unit mass of refrigerant flowing through the condenser; and 3. The COP	**07**

	(b)	Why is the balancing of components of refrigeration system required?	**07**
Q.4	**(a)**	What is the function of the following components in absorption system: (i) Absorber (ii) Rectifier (iii) Analyser (iv) Heat exchanger	**07**
	(b)	Draw a neat sketch of LiBr-H2O absorption system and explain its working. List the major field of applications of this system.	**07**

OR

Q.4	**(a)**	The following values refer to LiBr-H_2O absorption system without solution heat exchanger Condensing Temperature = 30°C; Evaporator Temperature = 10°C Absorber Temperature = 30°C; The Generator Temperature = 80°C condensate temperature = 25°C The concentration of liquid leaving the generator is 0.65 and its enthalpy is (-75 kJ/Kg). The concentration of liquid leaving the absorber is 0.51 and its enthalpy is (-170 kJ/kg). The enthalpy of vapor leaving the generator is 2620 kJ/kg. The mass flow rate through evaporator is 0.4 kg/s. Compute: 1. Pressures in generator, condenser, evaporator and absorber 2. Cooling Capacity in TR 3. Heat Rejection to condenser and absorber 4. COP	**07**
	(b)	Derive an expression for the COP of an ideal vapor absorption system in terms of temperatures Tg at which heat is supplied to the generator, the temperature Te at which heat is absorbed in the evaporator and the temperature Tc at which heat is discharged from condenser and absorber.	**07**
Q.5	**(a)**	Explain the application of refrigeration for food preservation. Explain how the refrigeration controls the spoilage of food	**07**
	(b)	Write a short note on refrigerated trucks used to transport large quantities of fresh and frozen perishable products	**07**

OR

Q.5	**(a)**	Explain the use of devices like side glass, filter dryer in a refrigeration system	**07**
	(b)	Discuss main sources of heat generation required to be considered while designing a Cold storage	**07**

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