Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII • EXAMINATION – SUMMER • 2014

Subject Code: X 71901 Date: 28-05-2014

Subject Name: Refrigeration and Air Conditioning

Time: 02:30 pm - 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. Use of p-h chart and steam tables is permitted.**

Q.1	**(a)**	Develop an expression for mass of motive steam required to entrain one kg of flashed vapour in a steam jet refrigeration system. State the effect of increase in condenser pressure on steam consumption.	**07**
	(b)	Draw a neat schematic of VCR system with two evaporators, compound compression, multiple expansion valve and flash inter cooling. Represent it on p-h diagram. Develop an expression for power and COP.	**07**
Q.2	**(a)**	An R-12 VCR system comprises multiple expansion valves, back pressure valve, one condenser, one compressor and two evaporators of 10TR and 30TR capacities maintained at 10°C and -10°C respectively. The condensing temperature is 40 °There is 10°C under cooling. The vapors leaving the evaporators are dry saturated. Assume isentropic compression. Determine :(i)mass flow rate in kg/s in each evaporator(ii)compressor power in kW (iii)COP of the system.	**07**
	(b)	Draw a neat named schematic of practical water-ammonia VAR system. Explain how moisture is separated in the analyzer and rectifier. Explain the benefits of liquid- liquid heat exchanger. Why is cooling water circulated in the absorber?	**07**
		OR	
	(b)	Draw the schematic of a Lithium bromide-water absorption refrigeration plant. Explain its working. State its disadvantages. Why is analyzer/rectifier not required?	**07**
Q.3	**(a)**	A sample of moist air has dbt=25 °C, RH=50% and barometer reading is 740 mm of mercury. Calculate: (i) partial pressure of water vapor and dry air (ii) specific humidity (iii) dew point temperature (iv) enthalpy (v) degree of saturation.	**07**
	(b)	Draw a neat named schematic of boot-strap air refrigeration system. Represent it on t-s diagram. Explain its working.	**07**
		OR	
Q.3	**(a)**	An air-water vapour mixture enters an adiabatic saturator at 30°C and leaves at 20°C, which is the adiabatic saturation temperature. The pressure remains constant at 100 kPa. Determine the relative humidity and specific humidity of inlet mixture.	**07**
	(b)	Distinguish between primary refrigerants and secondary refrigerants. Name desirable thermodynamic, chemical and physical properties of a good refrigerant.	**07**
Q.4	**(a)**	(i) Explain the following concepts: sol air temperature, Equivalent CLTD , Effective temperature	**05**
		(ii) What is infiltration load and ventilation load?	**02**
	(b)	(i) State the functions of flow control devices. Explain the working of Automatic expansion valve with a schematic.	**05**
		(ii) Describe about shell and coil condenser	**02**
		OR	

Q.4	**(a)**	Derive an expression for the equivalent diameter of circular duct corresponding to a rectangular duct of sides a and b ,for the same pressure loss per unit length, when: (i) the quantity of air passing through both the ducts is same, (ii) the velocity of air flowing through both the ducts is the same.	**07**
	(b)	Explain flywheel effect as applied to cooling load calculation with neat labeled diagram.	**07**
Q.5	**(a)**	Write short note on air-conditioning of small and big stores.	**07**
	(b)	Explain the working of window room air conditioner with a schematic. How split air conditioner differs from it?	**07**
		OR	
Q.5	**(a)**	(i) Describe various methods of preservation of food.	**04**
		(ii)Explain all water air conditioning system with neat diagram.	**03**
	(b)	Describe viscous impingement filter and dry filter.	**07**

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