Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 711003N **Date: 19-06-2014**

Subject Name: Advanced Refrigeration

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.**

Q.1	**(a)**	Evaluate performance characteristics of compressor-capillary tube by using balance point approach.	**07**
	(b)	Why the foods are freezed? What are the different methods of freezing? Give advantages of one over others.	**07**
Q.2	**(a)**	Discuss ñ Compound compression with inter-cooling is effective method of operationò	**07**
	(b)	With neat sketch explain working of walk-in coolers and its design principle.	**07**
		OR	
	(b)	In an ammonia system one evaporator is to provide 180 kW of refrigeration at -30°C and another evaporator is to provide 200 kW at 5°C. The system uses two-stage compression with flash inter cooling and removal of flash gas. The condensing temperature is 40°C. Calculate power required by compressors. Please draw a schematic diagram of the system and depicts the state points on p-h diagram.	**07**
Q.3	**(a)**	Differentiate between primary refrigerants and secondary refrigerants.	**07**
	(b)	A boot strap cooling system of 20 tons is used in an aeroplane. The temperature and pressure conditions of atmosphere are 20°C and 0.8 bar. The pressure of air is increased from 0.8 bar to 0.96 bar due to ramming. The pressures of air leaving the main and auxiliary compressor are 3.5 bar and 5.25 bar respectively. Isentropic efficiency of compressors and turbine are 85% and 80% respectively. 60% of the total heat of air leaving the main compressor is removed in the first heat exchanger and 35% of their total heat of air leaving the auxiliary compressor is removed in the second heat exchanger. Find: (a) Power required to take cabin load (b) COP of the system The cabin pressure is 1.03 bar and temperature of air leaving the cabin should be greater than 27°C. Assume ramming action to be isentropic.	**07**
		OR	
Q.3	**(a)**	Describe with a schematic and T-s diagram the Boot-strap air refrigeration system for air craft.	**07**
	(b)	What are the zero ODP alternatives to replace R-22 refrigerant used in air-conditioners?	**07**
Q.4	**(a)**	Draw a neat sketch of ñElectrolux refrigeratorò and explain its working principal.	**07**
	(b)	Define the figure of merit related to thermo-electric refrigeration system and explain its effect on COP of the system	**07**
		OR	
Q.4	**(a)**	In an aqua ammonia refrigeration system, the highest and lowest pressure ar 16bar and 3 bar respectively. The concentration of strong solution is 0.4 the degassing range is 0.1. With suitable assumption, find COP of system for 10TR machine.	**07**

(b) Explain Li Br ï Water vapour absorption refrigeration system with neat sketch **07**

Q.5 **(a)** Describe the working of a steam jet refrigeration system with schematic diagram **07**

(b) Explain why ñheat pumpò is most efficient when used for heating purposes? **07**

OR

Q.5 **(a)** The following data refer to a steam ejector refrigeration system: **07**

Condition of the motive steam: é é é 7 bar, dry saturated
Temperature of water in the flash chamber:é é .4°C
Temperature at which make-up water supplied:é é é é ..17°C
The pressure at which condenser is operated :é é é 0.06 bar
Nozzle efficiency: 90%; Entrainment efficiency: 60%; Compression efficiency: 70%; the quality of steam and flash vapour at the beginning of compression: 92%
Determine the following
(i) Mass of motive steam required per kg of flash vapour
(ii) Refrigerating effect per kg of flash vapour

(b) Explain cascade refrigeration system with neat sketch. **07**

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