Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER I (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2711003 **Date:19/05/2016**

Subject Name: Advanced Refrigeration

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.**
4. **Use of refrigerants data book is permitted**

Q.1 **(a)** Discuss applications where HFC-134a refrigerant is widely used. What are the environmental concerns associated with HFC refrigerants? **07**

(b) Explain the working principle of steam jet refrigeration cycle with neat sketch and depicts the various state point of the system on T-s diagram. **07**

Q.2 **(a)** Explain the working of boot strap air refrigeration system with a neat sketch and T-s diagram. **07**

(b) The speed of an aircraft flying at an altitude of 8000 meters, where the ambient air is at 0.341 bar pressure and 263 K temperature, is 900 km/h. The compression ratio of the air compressor is 5. The cabin pressure is 1.013 bar and the temperature is 27℃. Determine the following **07**

(a) Power required to for refrigeration

(b) Refrigerating capacity on the basis of 1 kg/s of air flow.

OR

(b) Explain a traditional method (balance point) of system analysis used by engineers using suitable example. **07**

Q.3 **(a)** Explain with neat sketch and p-h diagram the multiple evaporators VCR system having different temperatures and employed with single compressor, individual expansion valves and back pressure valves. **07**

(b) The refrigeration system using R-12 as refrigerant consists of three evaporators of capacity 20 TR, 30 TR and 10TR with individual expansion valves and individual compressors. The temperature in three evaporators is maintained at -10℃, 5℃ and 10℃ respectively. The vapor leaving the evaporators is dry and saturated vapor. The condenser temperature is 40℃ and the liquid refrigerant leaving the condenser is sub-cooled to 30℃. Assuming isentropic compression determine the refrigerating mass flow rate in each evaporators, power required to drive compressors and COP of system. **07**

OR

Q.3 **(a)** Sketch and explain cascade refrigeration system using T-s and P-h diagrams. **07**

(b) A two stage R-134a refrigeration system operates between the pressure limits of 1.3 bar and 7.7 bar. The refrigerant leaves the condenser as a saturated liquid and is throttled to a flsh chamber operating at 2.9 bar. The part of refrigeration evaporates during the flashing process and this vapour is mixed with the refrigerant leaving the low pressure compressor. Then, the mixture is 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. The refrigerant entering lower stage compressor is saturated vapour. The mass of refrigerant circulates through condenser is 8 kg/min. **07**

Calculate: (i) Mass of liquid refrigerant evaporates in flash chamber (ii) power supplied to compressors (ii) COP of the system

Q.4 **(a)** Explain with neat sketch the LiBr-H_2O vapour absorption refrigeration system. **07**

	(b)	State the function of the following components in an absorption system. (i) Absorber (ii) Rectifier (iii) Analyser, and (iv) Heat Exchangers	**07**

OR

Q.4	**(a)**	The week aqua at 100℃ and 16 bar leaves the generator and enters a preheater. The temperature of the weak aqua leaving the preheater is 50 ℃. Determine the heat regained by the other fluid in the preheater.	**07**
	(b)	State the properties of ideal refrigerant absorbent combination.	**07**
Q.5	**(a)**	Discuss in brief about transport refrigeration.	**07**
	(b)	Explain the use of "heat pump" for heating and cooling cycle with neat sketch.	**07**

OR

Q.5	**(a)**	Explain the applications of refrigeration for food preservation. Explain how the refrigeration controls the spoilage of foods.	**07**
	(b)	Explain in brief about cold storages. Discuss parameters are to be considered in the design of cold storages.	**07**

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