GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 712102N   **Date: 04-06-2013**
Subject Name: Advanced Refrigeration
Time: 10.30 am – 01.00 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)** Following data is available for 10 TR, R134a VCR system with flash gas removal. Condenser temperature = 40°C, Evaporator temperature = -30°C, Intermediate pressure = 3 bar, Temperature at exit to condenser = 30°C, Temperature at exit to evaporator = -25°C, Temperature at suction of compressor = -20°C. Volumetric efficiency of both compressors is 0.9 and compression is isentropic. Calculate mass flow through HP and LP compressor, total work done and COP. **07**

(b) A VCR cycle using R134a comprises of one compressor, one condenser and two evaporator of 10TR and 20TR capacity. The evaporators are maintained at 10°C and -10°C respectively. The system comprises multiple expansion valve with back pressure valve. The condenser temperature is 40°C and liquid is subcooled by 10°C in condenser. Assume isentropic compression. Calculate (a) mass flow rate of refrigerant through each evaporator (b) compressor power (c) COP **07**

Q.2 **(a)** Aqua ammonia solution at 110°C and 16 bar is saturated. It is throttled to 3 bar pressure. Draw isotherm. Determine x_l and x_v under equilibrium and temperature after throttling. **07**

(b) Explain the balance point approach for analysis of VCR system and enumerate the same for condensing unit. **07**

OR

(b) Explain the balancing of compressor and capillary tube in VCR system and effects of unbalanced conditions in compressor-capillary tube system. **07**

Q.3 **(a)** Explain thermodynamic and chemical properties of ideal refrigerants. **07**
(b) With schematic diagram explain single effect LiBr-H_2O vapour absorption system. List the various fields of application of this system. **07**

OR

Q.3 **(a)** Explain azeotropic mixtures. Explain the use of minimum boiling azeotropes in VCR cycles. **07**
(b) Sketch and explain cascade refrigeration system with T-s and p-h diagram. **07**

Q.4 **(a)** With schematic and T-s diagrams explain the working of Bootstrap air craft refrigeration cycle with Ram compression. **07**
(b) With schematic and T-s diagram explain steam jet refrigeration system. Also mention advantages and limitations of the same. **07**

OR

Q.4 **(a)** With schematic and T-s diagrams explain the working of Regenerative air craft refrigeration cycle with Ram compression. **07**
(b) Explain the various effects of thermoelectric refrigeration. **07**

Q.5 **(a)** Explain the various components of cooling load for a cold storage. **07**

(b) Explain the various methods of transport refrigeration. **07**

OR

Q.5 **(a)** Explain the use of heat pump for heating and cooling cycle with neat diagram. **07**

(b) Explain and compare ¬quick freezingø and ¬air blast freezing methodsø of food freezing. **07**

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