Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 711003N **Date: 12-01-2013**

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.**
4. **Use of refrigeration charts and tables is permitted.**

Q.1 (a) What are possible effects of an oversized (undersized) evaporator on refrigerated space condition **07**

(b) In a 50KW NH_3 plant, compression is carried out in two stages with water and flash intercooler, the following particulars are available: **07**

Condenser pressure=15bar
Evaporator pressure=2 bar
Flash intercooler pressure=5 bar
Limiting temperature for intercooler and sub cooling=30°C
Draw the cycle on P-h chart and calculate (1) COP,(2) Power required ,(3) Swept volume of each compressor if η_{vol} = 80% (4) heat rejection ratio

Q.2

(a) Explain with schematic diagram and p-h diagram , the working of multiple evaporator system with multiple expansion valves and back pressure valves. **07**

(b) State function and importance of following in vapour compression refrigeration system: Flash chamber, Flash intercooler, Back pressure valve **07**

OR

(b) What are secondary refrigerants? List their application and future of such industrial refrigerants. **07**

Q.3

(a) An aqua ammonia refrigeration system produces 100tons of refrigerants at -20°C. The environment is at -27°C. The degassing range is 0.1 and purity of ammonia is 0.995. Taking reflux temperature as 60 calculate (1) generator temperature,(2) amount of strong solution handled per kg of NH_3 (3) HCOP (4) Heat consumption per hour **07**

(b) An aircraft refrigeration plant has to handle a cabin load of 30 tonnes. The atmospheric temperature is 17°C. The atmospheric air is compressed to a pressure of 0.95 bar. and temperature of 30°C due to ram action. The air is then further compressed in a compressor to 4.75bar, cooled in a heat exchanger to 67°C expanded in turbine to 1 bar pressure and supplied to cabin. The air leaves the cabin at temperature of 27°C. the isentropic efficiencies of both compressor and turbine are 0.9 , calculate mass of air circulated per minute, COP. **07**

OR

Q.3	(a)	List advantages of air refrigeration system.List various methods used in air craft and explain any one.	**07**
	(b)	Explain Li Br –Water vapour absorption refrigeration system with neat sketch.	**07**
Q.4			
	(a)	State principle of thermoelectric refrigeration and explain its analysis?	**07**
	(b)	Explain with graphs the effect of evaporator temperature and supply steam pressure on consumption of steam required per ton of refrigeration and give its causes.	**07**
		OR	
Q. 4	(a)	With neat sketch explain working of walk-in coolers and its design principle.	**07**
	(b)	Why the foods are free zed? What are different methods of freezing? Give advantages of one over the other. Mention the field of application of each type of freezing method.	**07**
Q.5			
	(a)	List industrial application of heat pumps with suitable examples.	**07**
	(b)	Ina steam jet refrigeration system to be installed in a steel factory where 600MJ/hr of waste heat is available for production of saturated steam at 6 bar. The quality of vapour before the compression in main ejector is 0.86 dry. The vapour at end of compression is just in saturated state. The chiller temperature is maintained at 280K. The nozzle efficiency is 98% make up water and condensing temperature are 303K, 309 K, Determine capacity of plant, heat transfer from condenser, volume handled by ejector.	**07**
		OR	
Q.5	(a)	List advantages and limitations of steam jet refrigeration system	**07**
	(b)	What are the characteristics of good lubricant? Also explain various Lubrication methods.	**07**

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