Enrolment No.___

GUJARAT TECHNOLOGICAL UNIVERSITY ME - SEMESTER- I (OLD course) • EXAMINATION - SUMMER 2015 Subject Code: 712102 Date: 12/05/2015

Subject Name: ADVANCED REFRIGERATION

Time: 10:30 am to 1:00 pm

Total Marks: 70

- Instructions:
 - 1. Attempt all questions.
 - 2. Make suitable assumptions wherever necessary.
 - 3. Figures to the right indicate full marks.
- (a) Explain the balancing of compressor and capillary tube in VCR system 0.1 07 and effects of unbalanced conditions in compressor-capillary tube system
 - (b) Name the alternative refrigerants to R12. In this context discuss the advantages 07 of using R134a in place of R12 in domestic Refrigerator.
- **Q.2** Describe the VCR cycle with P-h diagram having multiple evaporators with 07 **(a)** individual expansion valve and with individual compressor.
 - (b) Calculate the power required by the two compressors in an ammonia system 07 which servers a 250 kW evaporator at -25°C. The system uses two-stage compression with intercooling and flash gas removal. The condensing temperature is 35°C. The intermediate pressure in flash intercooler is equal to =

OR

- (b) In an ammonia system one evaporator is to provide 180 kW of refrigeration at 07 -30°C and another evaporator is to provide 200 kW at 5°C. The system uses two-stage compression with flash intercooling. The condensing temperature is 40°C. Calculate the power required by the compressors.
- (a) Explain with a neat sketch the working of a water-lithium bromide absorption **Q.3** 07 refrigeration system.
 - (b) A simple air cooled system is used for an aeroplane having a load of 9 TR. The 07 atmospheric pressure and temperature are 0.9 bar and 10°C respectively. During ramming pressure increases to 1.013 bar. In the heat exchanger, the temperature of air reduced by 55°C. The pressure in the cabin is 1.01 bar and the temperature of air leaving the cabin is 25°C. Determine: (i) power required to take the load of cooling (ii) COP of the system. Assume that all the expansions and compressions are isentropic. The pressure of the compressed air is 4 bar.

OR

- In an aqua ammonia absorption system, the highest and lowest pressures are 16 07 0.3 (a) bar and 3 bar respectively. The concentration of strong solution is 0.4 and degassing range is 0.1. With suitable assumption find COP for 10 TR machine. 07
 - (b) Describe with neat sketch a regenerative air-refrigeration system.
- 0.4 **(a)** The steam at 8 bar pressure saturated passes to steam ejector water vapour 07 refrigeration system. The temperature of water in flash chamber is 5°C. Make up water is supplied at 20°C. The absolute pressure in the condenser is 0.06 bar. The nozzle efficiency 86%, the entrainment efficiency is 64 % and compression efficiency is 80 %. The quality of the motive steam and flashed vapour mixed together at the beginning of compression is 90 % dry. Determine
 - (i) Mass of motive steam required per kg of flashed vapour
 - (ii) Refrigeration effect per kg of flashed vapour.
 - (b) Define Seebeck effects, Thomson effect and Peltier effect in connection with 07 thermoelectric refrigeration system.

| Q.4 | (a) | Describe the working of steam jet refrigeration system with the help of neat | 07 |
|-----|------------|--|----|
| | | sketch. | |
| | (b) | Define the figure of merit related to thermo-electric refrigeration system and explain its effect on COP of the system | 07 |
| Q.5 | (a) | Cite few industrial examples where heating and cooling is simultaneously required and explain why heat pump is more suitable for such applications | 07 |
| | (b) | Discuss different methods of food Freezing. | 07 |
| | | OR | |
| Q.5 | (a) | With neat sketch explain working of walk-in coolers. | 07 |
| | (b) | Explain the various methods of transport refrigeration. | 07 |
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