Kaferelsheikh University — First Semester
Faculty of Engineering — Date: 31/12/2016
Dept. Of Mechanical Engineering ٥ ٨ — Time : 3 Hours
Fourth year   Final Exam of (Refrigeration and air condition)   Full mark: 75

Answer all the following Questions (allowable tables and charts)
Assume any missing data

Question 1

Consider a two-stage compression refrigeration system operating between the pressure limits of 1.5 and 0.14 MPa. The working fluid is refrigerant-11. The refrigerant leaves the condenser as a saturated liquid and is throttled to a flash chamber operating at 0.35 MPa. Part of the refrigerant evaporates during this flashing process, and this vapor is mixes with the refrigerant leaving the low-pressure compressor. The mixture is then 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 as it vaporizes in the evaporator. Assuming the refrigerant leaves the evaporator as a saturated vapor and both compressors are isentropic with efficiency =0.9, Determine:- (a) the fraction of the refrigerant that evaporates as it is throttled to the flash chamber, (b) the amount of heat removed from the refrigerated space and the compressor work per unit mass of refrigerant flowing through the condenser, and (c) the coefficient of performance?

Question 2

A R12 reciprocating compressor with 5% clearance is to be designed for 7.5 TR capacity at 5°C evaporating and 40°C condensing temperature. The compression index may be taken as 1.15. The number of cylinders may be selected as two and the mean piston speed as 3 m/s. the pressure drops at suction and discharge valves assumed as 0.2 and 0.4 bar respectively. Determine:-
  i)   Power consumption of the compressor and C.O.P of the cycle.
  ii)   Volumetric efficiency of the compressor
  iii)   Bore, stroke, and r.p.m of the compressor (take stroke/bore =0.8)
  iv)   If the evaporating temperature drop to 0°C with the condenser temperature and other conditions remaining same, what will be the capacity and power consumption of this compressor and C.O.P of the system.

Question 3

  i)   Explain with sketch the types of expansion devices?
  ii)   Explain sketch the types of condensers?

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iii)   Complete the following tables

	Refrigerant number	type	Chemical formula
1	R_{114}	Pure fluid- halocarbon-CFC	
2	R_{22}		
3	R_{410a}		
4	R_{717}		
5	R_{600}		
6	R_{134a}		
7	R_{503}		40.1% R22and 59.9% R13

Question 4

Design the cold storage in kafr El-sheikh with dimension 7×12×4 m used to store the 300-ton of cow meat.

Good luck