Total No. of Printed Pages:3

SUBJECT CODE NO:- P-355
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Mech) Examination MAY/JUNE-2016
Refrigeration and Air Conditioning
(Revised)

[Time: Three Hours] **[Max Marks:80]**

"Please check whether you have got the right question paper."

N.B
1) Attempt any three questions from each section.
2) Use of refrigerant tables, p-h charts steam table and non-programmable calculator is permitted.
3) Figure to the right hand margin indicates full marks.
4) Assume suitable data, if necessary.

Section A

Q.1
a) Differentiate between refrigerator and heat pump with sketch. 03
b) Explain the term "Tonne of Refrigeration and show it's equivalent to 3.5KW." 03
c) The capacity of a refrigerator is 250TOR when working between -5^{0}C and 25^{0}C. Determine the mass of ice produced per day from water at 25^{0}C. Also find out the power required to drive the unit. Assume that the cycle operates on reversed Carnot cycle and latest heat of ice is 335 KJ/kg. 06

Q.2 A refrigerating plant of 10 TOR capacity has its evaporation temperature -10^{0}C and condenser temperature of 40^{0}C. The refrigerant R-12 is sub cooled 4^{0}C before entering the expansion value and the vapor is super-heated 6^{0}C before leaving the evaporator coil. The compression of the refrigerant in the compressor is isentropic. Determine. 13

1) Refrigerating effect
2) Mass flow rate of refrigerant
3) C.O.P
4) Theoretical piston displacement.

Q.3 A two stage R-22 machine is required to produce 15 TOR at -40^{0}C when the ambient temp. Is 40^{0}C. It uses a flash intercooler. The refrigerant is dry saturated at the section of the compressors. There is no sub cooling of liquid refrigerant leaving the condenser. Determine. 13

i) Mass circulation of refrigerant in LP as well as in HP circuit.
ii) Power requirement
iii) Inter cooler pressure and temp
iv) COP

Q.4 A simple air cooled system is usual for an aero plane to take the load of 25 tons. Atmosphere temp. And pressure conditions are 18^{0}C and 0.9 bar respectively. The pressure of air is increased due to isentropic ramming from 0.9 bar to 1 bar. The pressure of air leaving the main compressor is 3.5 bars and its 55% heat is removed in the air cooled heat exchanger and then it is passed through an evaporator cooler for further cooling. The temp. Of air is reduced by 10^{0}C in the evaporator.- cooler. Lastly the air is passed through cooling turbine and then it is supplied to the cooling cabin where the pressure is maintained at 1.03bar. Assuming isentropic efficiency of the compressor and turbine are 80% and 75%. Find 13

1) Power capacity required to take the load in the cooling cabin.
2) COP of the system.
The temp of air leaving the cabin should not exceed 25^{0}C.

Q.5 Write short notes on the following (any three) 14

1) Methods to improve COP of Vcc.
2) Actual vapour compression cycle.
3) Boot strap cooling air system
4) Necessity of air cooling aero plane
5) DART

Section B

Q.6 a) Explain lithium bromide vapour absorption refrigeration method. 06

b) With the help of neat sketch, explain simple vapour absorption system. 06

Q.7 a) What are the desirable properties of an ideal refrigerant? 06

b) What is secondary refrigerant? Where is it used? Explain its importance in ice manufacturing plants. 07

Q.8 a) Explain the following terms 06

i) Degree of saturations.
ii) GSHF
iii) ADP

b) The following reading were taken from a sling psychrometer. Dry bulb temp. 27^0C, WBT 17^0C, barometer reading 730mm of Hg. Using steam table determine. 07

1) Dew point temp
2) Relative humidity.
3) Specific humidity
4) Degree of saturation.

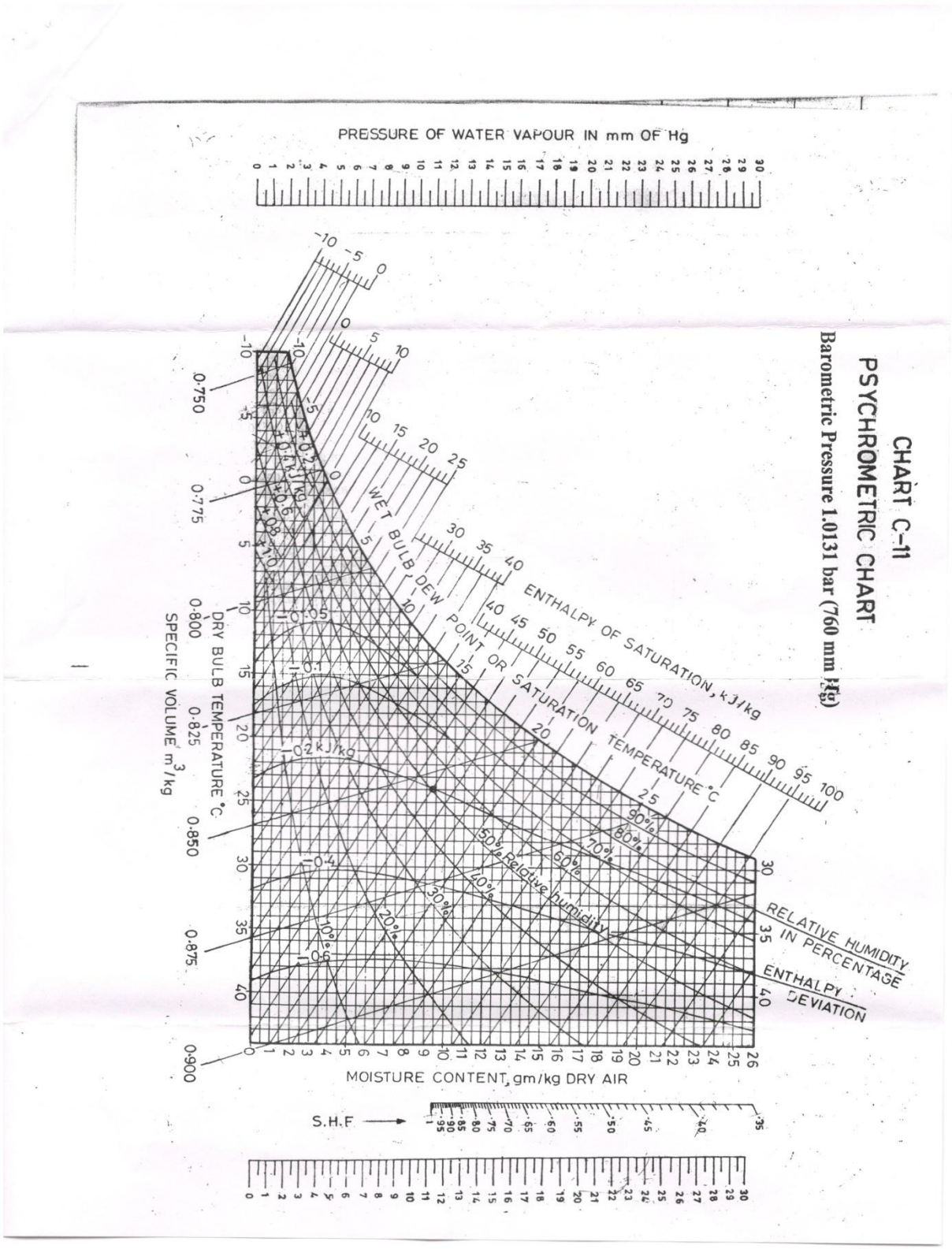
Q.9 The following data refer to a summer air conditioning of a building. Outdoor design conditions=40^0 DBT, 30^0 WBT inside design conditions = 25^0 DBT, 50% RH Room sensible heat gain = 90000 KJ/hr Room latent heat gain = 23,000 KJ/hr by pass factor of cooling coil = 0.2 13

The return air from room is mixed outside air before entry to cooling coil in the ratio of 4:1. Determine

i) ADP of coil
ii) Entry and exit condition of air for cooling coil.
iii) Fresh air mass flow rate.
iv) Refrigerating load.

Q.10 Write short notes on (any three) 14

1) Steam jet refrigeration system
2) Water cooler
3) Ice plant
4) GWP & ODP
5) Central air conditioning



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