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FACULTY OF ENGINEERING & TECHNOLOGY

B.E (Mech) Year Examination - June – 2015

Refrigeration and Air Conditioning

(Revised)

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

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

N.B
i) Attempt any three questions from each section.
ii) Use of refrigerant tables, p-h charts, steam tables and electronic non-programmable calculator is permitted.
iii) Figures to the right hand margin indicate full marks.
iv) Assume suitable data, if necessary.

SECTION-A

Q.1 a) Explain the effect of suction super heating and liquid sub cooling on the performance of simple VCC. 03

b) Differentiate between refrigerator and heat pump with sketch. 04

c) A reversed Carnot cycle working as a heat pump is delivering 6000KJ/min to heat the conditioned space and maintain it at 27^0C when the atmosphere temp. is 17^0C. Determine heat transfer in the conditioned space from atmosphere and power required to operate the cycle. 06

Q.2 A vapour compression machine is used to maintain a temp of 250K is refrigerated space. The ambient temp is 310K. The compressor takes is dry saturated vapour of R-12. A minimum 10^0C temp difference is required at the evaporator as well as at condenser. There is no sub cooling of liquid. if refrigerant flow rate is 2kg/min. find 13

i) Tonne of refrigeration.
ii) Power requirement.
iii) Ratio of cop of this cycle to cop of Carnot cycle.

Q.3 The following data refer to a two stage compression ammonia refrigerating system with water cooler. Condenser pressure = 14 bar, Evaporator pressure = 2 bar. Inter cooler pressure = 6 bar load on the evaporator = 3 TOR. It the temp of the desaperheated vapour and sabcooled liquid refrigerant are limited to 30^0C. find 12

i) The power required to drive the system
ii) COP of the system.

Q.4 An air cooling system for a jet plane cockpit operates on a simple cycle. The cockpit is to be maintained at 25^0C. The ambient pressure and temp are 0.35 bars and -15^0C respectively. The pressure ratio of jet compressor is 3. The plane speed is 1100 km/hr. the air is passed through a heat exchanger after compression and cooled to its original condition entering into the jet plane. The pressure drop through the cooler for coil is 0.1 bars. The pressure of air leaving the cooling turbine is 1.06 bars and that of cock pit is 1.01325 bars. The cockpit cooling load is 60kw. Calculate 13

i) Stagnation temp and pressure of entering the compressor.
ii) Mass flow rate of air circulated
iii) Volume handled by comp and expander.
iv) Net power delivered by the engine to refrigeration unit.
v) C.O.P of the system.

Assume compression and expansions of air are isentropic. Take Cp (air)= 1KJ/kg^{0}k

Q.5 Write a short note on the following (any three) 15

a) Cascade refrigeration system
b) Actual vapour compression cycle
c) Compare simple vapour compression cycle with multistage vapour compression cycle
d) Limitation of simple VCC
e) DART

SECTION -B

Q.6 a) Explain lithium-Bromide water vapour absorption system with neat sketch. 06

b) Distinguish between vapour absorption refrigeration system with vapour compression refrigeration system. 06

Q.7 a) Explain the procedure for designation of refrigerants. 07

b) Discuss the factors considered for the selection of refrigerant for a refrigeration system. 06

Q.8 a) Explain sling psychomotor with neat sketch. 06

b) For a dry bulb temperature of 30^0C and a relative humidity 50% calculate the following for air when the barometric pressure is 740mm of hg. 07

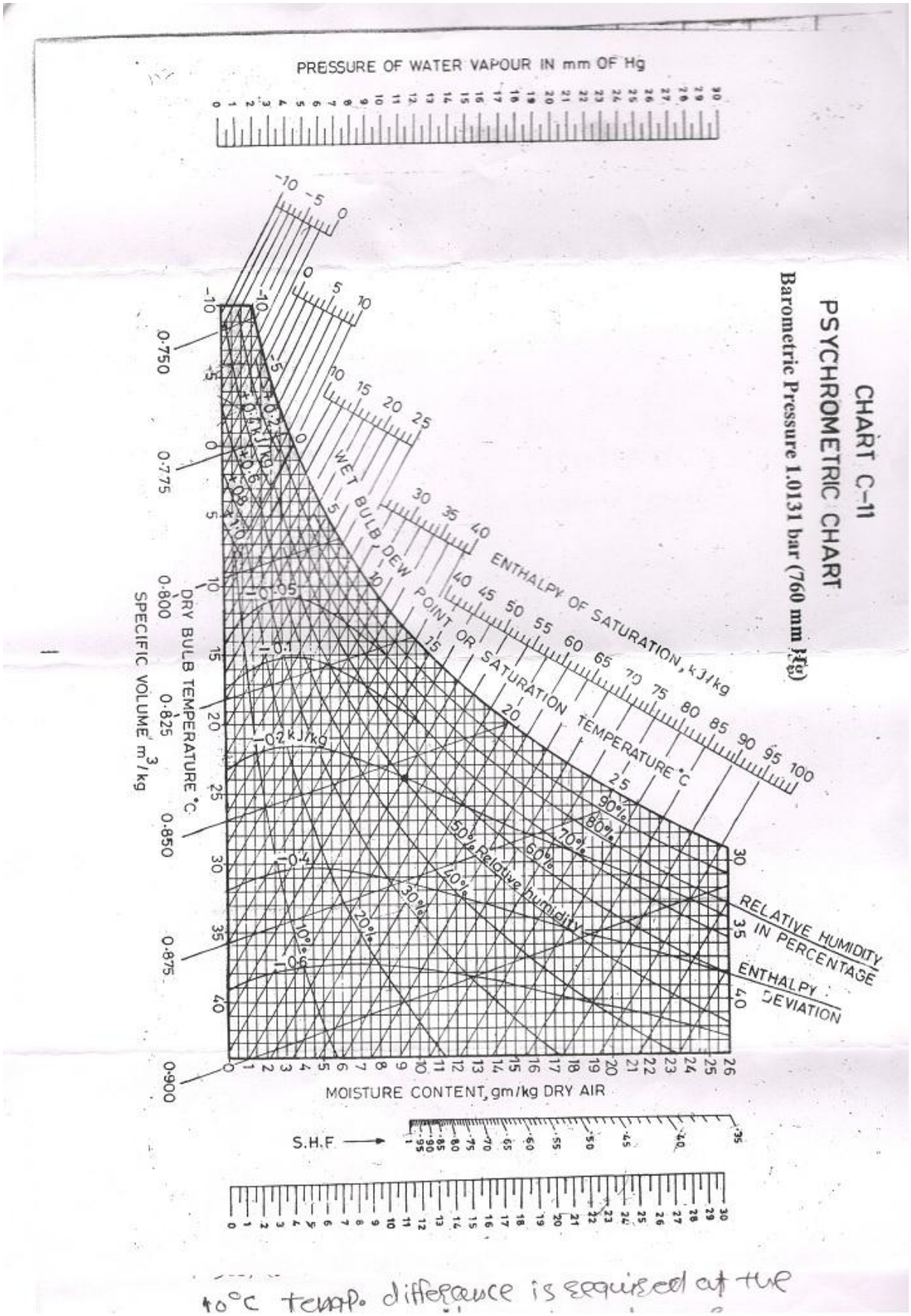
i) Partial pressure of water vapour and dry air
ii) SP humidity
iii) Relative humidity
iv) Enthalpy

Q.9 An air conditioned auditorium is to be maintained at 25^0C dry bulb and 55% R.H. the ambient conditions is 42^0C DBT and 32^0C WBT. 60% of the return air is recirculated and mixed with 40% of makeup air after the cooling coil. The total sensible heat load is 120000KJ/hr. and the total latent heat load is 44000 KJ/hr The condition of air leaving the cooling coil is at 18^0C. determine 15

i) RSHF ii) The conditions of air entering the auditorium
iii) The amount of makeup air iv) Apparatus dew point
v) By pass factor of the cooling coil.

Q.10 Write short notes on any three. 15

a) Domestic refrigerator
b) Window air conditioning system
c) GWP & ODP
d) Hainan comfort.
e) Ice Plant



40°C temp. difference is required at the