Total No. of Printed Pages:4

SUBJECT CODE :90
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Mech) Examination Nov/Dec 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 table and non-programmable calculator is permitted.
iii) Figure to the right hand margin indicates full marks.
iv) Assume suitable data if necessary

SECTION-A

Q1. a) Why it is necessary to modify Carnot cycle? Explain. 03

b) Explain the effect of suction superheating and liquid sub-cooling on the performance of simple Vcc. 04

c) A refrigerating system operates on the reversed Carnot cycle. The higher temp of the refrigerant in the system is 40^0C and lowers is -15^0C. The capacity of the machine is 15 tonnes. Neglecting all losses find coefficient of performance. 05

i) Heat rejected from the system/hour.
ii) Power required for driving the machine.

Q.2 A VCC Refrigerating machine is used to produce 10 TOR at -20^0C When operating in the environment at 40^0C. The 13

Refrigerant is R-12. A minimum temp. Difference of 10^0C is required for heat transfer in the condenser and evaporator. The adiabatic efficiency of the compressor is 85%. Assuming dry saturated condition of refrigerant at the entry to the compressor, calculate

i) Power of the compressor.
ii) C.O.P.
iii) Heat rejected in the condenser.

Q.3 In a 20 TOR ammonia plants, compression is carried out in two stages with water and flash intercooling and water subcooling. The particulars of the plant are a follows 13

Condenser pressure=12 bar

Evaporator pressure=3 bar

Flash intercooler pressure=6 bar

Limiting temp. for intercooling and subcooling 20^0C

Estimate:

i) The cop of the plants
ii) Power required for each compressor
iii) The swept volume for each compressor If ηv of both comp. is 80%.

Q.4 A bootstrap evaporative air refrigeration system is used for an aeroplane to take 25 TOR load. The ambient conditions are 15^0C and 0.8 bar. The pressure of air is increased from 0.8 bar to 0.98 bar due to ramming action. The pressure of the air leaving the main compressor and auxiliary compressor are 3.8 bar and 5.45 bar respectively. The isentropic efficiency of both compressor is 90%, 60% of the total heat of the air leaving the main compressor is removed in the First heat exchanger and 35% of the total heat of the air living the auxiliary compressor removed in the second heat exchanger. 13

Assuming that ramming is isentropic and cabin pressure is 1.03 bar. Find the followings.

i) Power required to take cabin load.
ii) Cop of the system

Temp of air leaving the cabin should not exceed 27^0C

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

i) Methods to improve cap of Vcc
ii) Cascade refrigeration method
iii) Compare vapour compression cycle with air refrigeration cycle
iv) Bell coleman cycle
v) Necessity of air cooling in aero plane.

SECTION-B

Q.6 a) With the help of neat sketch, explain practical vapour absorption system. 07

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

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

b) Explain the necessity of finding alternatives to CFC's. What are the better options available for CFC's? 06

Q.8 a) Define the following terms. 06

i) RSHF
ii) Relative humidity
iii) Specific humidity

b) The pressure and temperature of air is 720 mm of Hq and 21^0C(WBT) respectively . The dew point temperature of the mixture is 15^0C. Find the following by using stem table 07

i) Partial pressure of water vapour
ii) Relative humidity
iii) Specific humidity
iv) Enthalpy of moist air

Q.9 An air conditioned has is to be maintained at 27^0C DBT and 21^0C WBT It has a sensible heat load of 50 kw and latent heat load of 19KW. The air supplied from outside atmosphere at 40^0DBT and 30^0C WBT is 25m^3/min directly into the room through ventilation and infiltration outside air to be conditioned is passed through the cooling coil where ADP is 15^0C. The quantity of recirculate air from the hall is 60% This quantity is mixed with the conditioned air after the cooling coil. Determine. 13

i) Condition of air after the coil and before the recirculate air mixes with it
ii) Condition of air entering the hall (after mixing with recirculate air
iii) Mass of fresh air entering the cooler
iv) Refrigeration load on the cooling coil.

Q.10 Write a short note on (any three) 14

i) Summer air conditioning
ii) Window air conditioning
iii) ICE plant
iv) Cascade refrigeration system
v) GWP and ODP

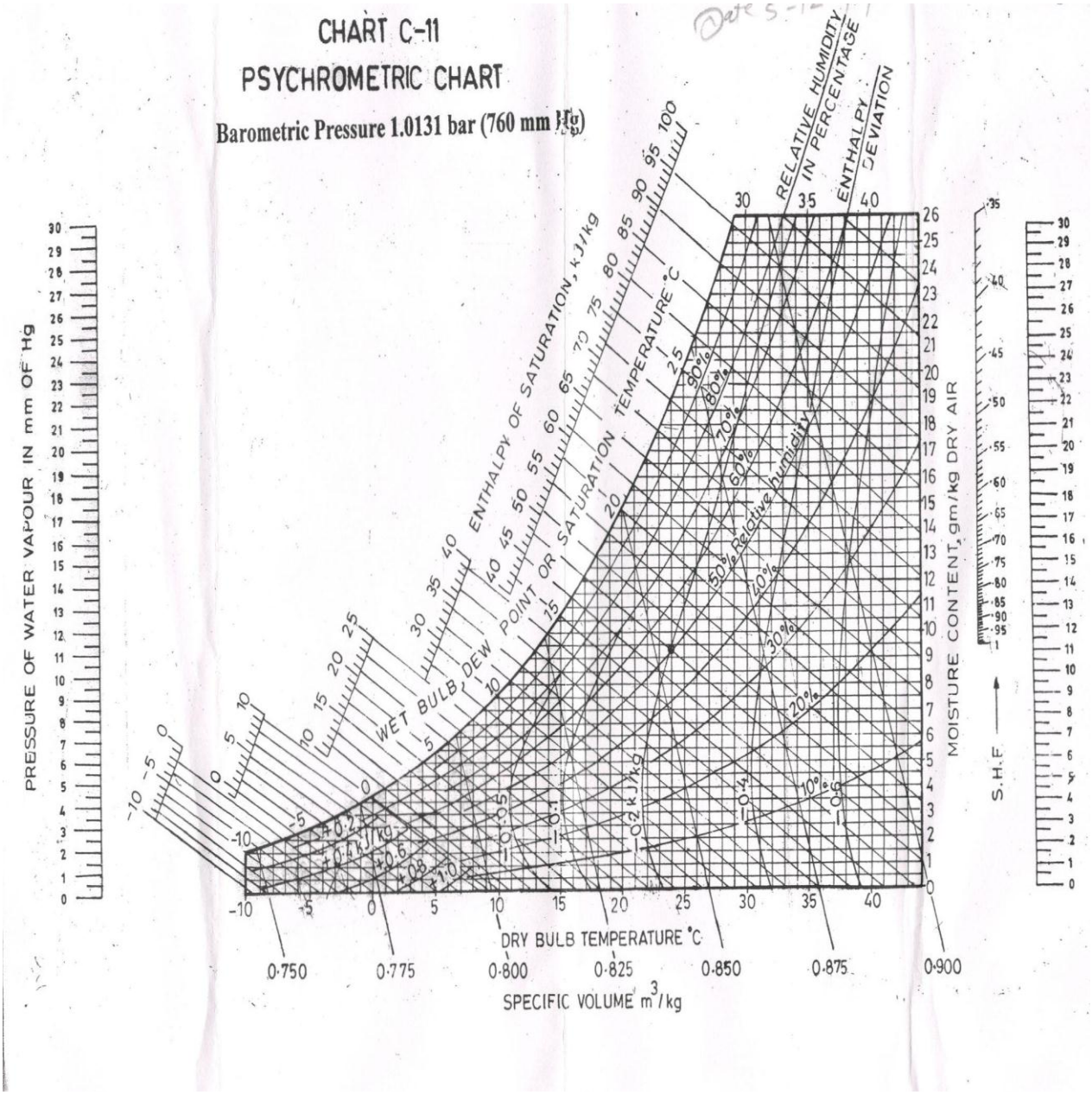
CHART C-11
PSYCHROMETRIC CHART
Barometric Pressure 1.0131 bar (760 mm Hg)
PRESSURE OF WATER VAPOUR IN mm OF Hg
WET BULB, DEW POINT OR SATURATION TEMPERATURE °C
ENTHALPY OF SATURATION, kJ/kg
RELATIVE HUMIDITY IN PERCENTAGE
ENTHALPY DEVIATION
MOISTURE CONTENT, gm/kg DRY AIR
S.H.F
DRY BULB TEMPERATURE °C
SPECIFIC VOLUME m³/kg
0·750
0·775
0·800
0·825
0·850
0·875
0·900

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