Total No. of Questions :10]

SEAT No. :

P3571

[Total No. of Pages : 6

[5560]-515
T.E. (Mechanical)
REFRIGERATION AND AIR CONDITIONING
(2015 Pattern) (Semester-II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tabies is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw the neat schematic of ice plant and explain its working. Discuss the secondary refrigerants used in ice plant. **[5]**

b) Explain ozone depletion reaction. Describe alternatives for unitary air conditioning systems. **[5]**

OR

Q2) a) 300kJ/min refrigeration system operates on a vapor-compression refrigeration cycle with refrigerant R-134a as the working fluid and an isentropic efficiency of 85 percent for the compressor. The refrigerant enters the compressor as a saturated vapor at 1.40 Bar and is compressed to 8.00 Bar. Determine (a) the quality of the refrigerant at the end of the throttling process, (b) the coefficient of performance and (C) the power input to the compressor. **[6]**

b) Explain the design features of an air conditioning system for multiplex. **[4]**

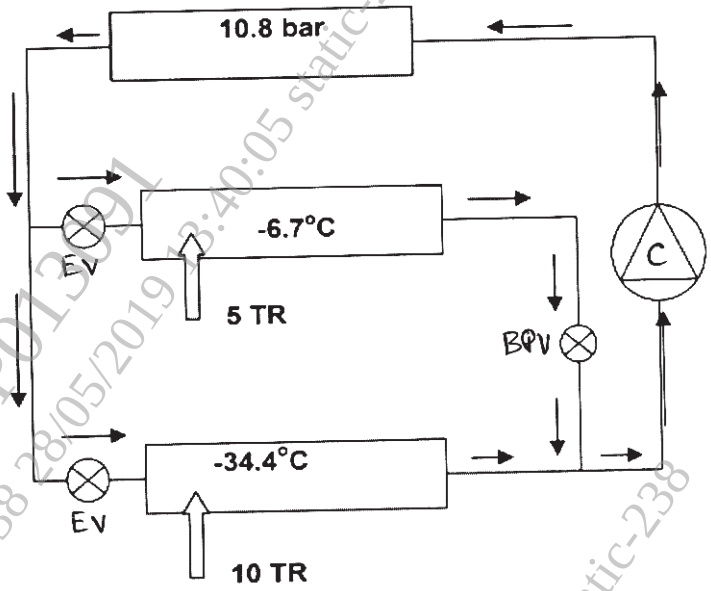
Q3) a) Explain Linde-Hampson cycle with neat diagram. Give its applications. **[5]**

b) Discuss the methodology for calculating LCCP of various refrigerants. **[5]**

OR

P.T.O.

Q4) A system working with ammonia as refrigerant is shown in fig. **[10]**



Assuming saturated conditions at the exit of evaporators and condenser, ammonia vapour to behave as an ideal gas with a gas constant of 0.4882 kJ/kg. K and isentropic index (Cp/Cv) of 1.29, and isentropic compression :

a) Find the required power input to compressor in kW

b) Find the required power input if instead of using a single compressor, individual compressors are used for low and high temperature evaporators.

Use properties from table.

T°,C	P_{sat} (kPa)	h_f (kJ/kg) (sat.liquid)	h_g (kJ/kg) sat.vapour
-34.4	95.98	44.0	1417
-6.7	331.8	169.1	1455
27.7	1080.0	330.4	1485

Q5) a) A retail shop located in a city has the following cooling loads: **[12]**

Room sensible heat = 58.15 kW

Room latent heat = 14.54 kW

Indoor and outdoor design conditions are:

Outside : 40°C DBT, 27°C WBT

Inside : 25°C DBT, 50% RH

70 cmm of ventilation air is used. Determine the followings:

Ventilation load, GTH, ESHF, ADP dehumidified air quantity, condition of air entering and leaving apparatus.

Take Bypass factor of apparatus as 0.15

b) Write a note eon : IAQ Requirements. **[6]**

OR

Q6) a) Explain: Specific humidity, Relative humidity, and WBT. **[6]**

b) A laboratory has the following cooling loads: **[12]**

Room sensible heat = 50 kW

Room latent heat = 12 kW

Indoor and outdoor design conditions are :

Outside : 40°C DBT, 27°C WBT

Inside : 25°C DBT, 50% RH

50 cmm of ventilation air is used. Determine the followings, if coil ADP is 10°C:

Ventilation load, GTH, ESHF, BF, dehumidified air quantity, condition of air entering and leaving apparatus.

Q7) a) With neat schematic explain all air system. What are the advantages and disadvantages over all water system? **[8]**

b) Classify refrigerant compressor. Explain working of any two in details. **[8]**

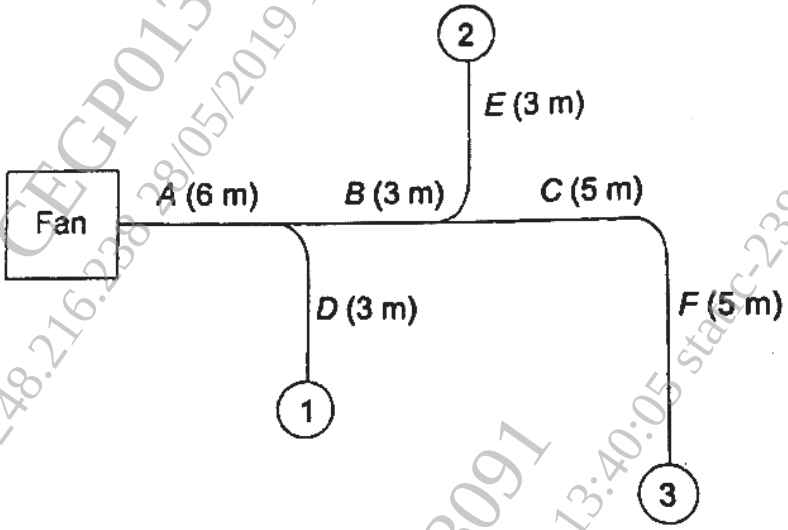
OR

Q8) a) Draw neat diagram of EXV and explain its working. What is the selection criteria for expansion device? **[8]**

b) Describe all year round air conditioning system. **[8]**

Q9) a) Classify duct system. Explain commonly used duct materials. **[6]**

b) In the duct layout shown in Fig. Below, outlet 1 and 2 deliver 20 cmm each and outlet 3 delivers 28 cmm. Select the velocity of 8 m/s in section-A. Size the duct system using the equal friction method and determine its static pressure requirement. **[10]**



Q10) a) Explain types of fans used in ducting system. Give their selection criteria. **[6]**

b) Explain, how pressure loss is calculated in the followings: **[10]**

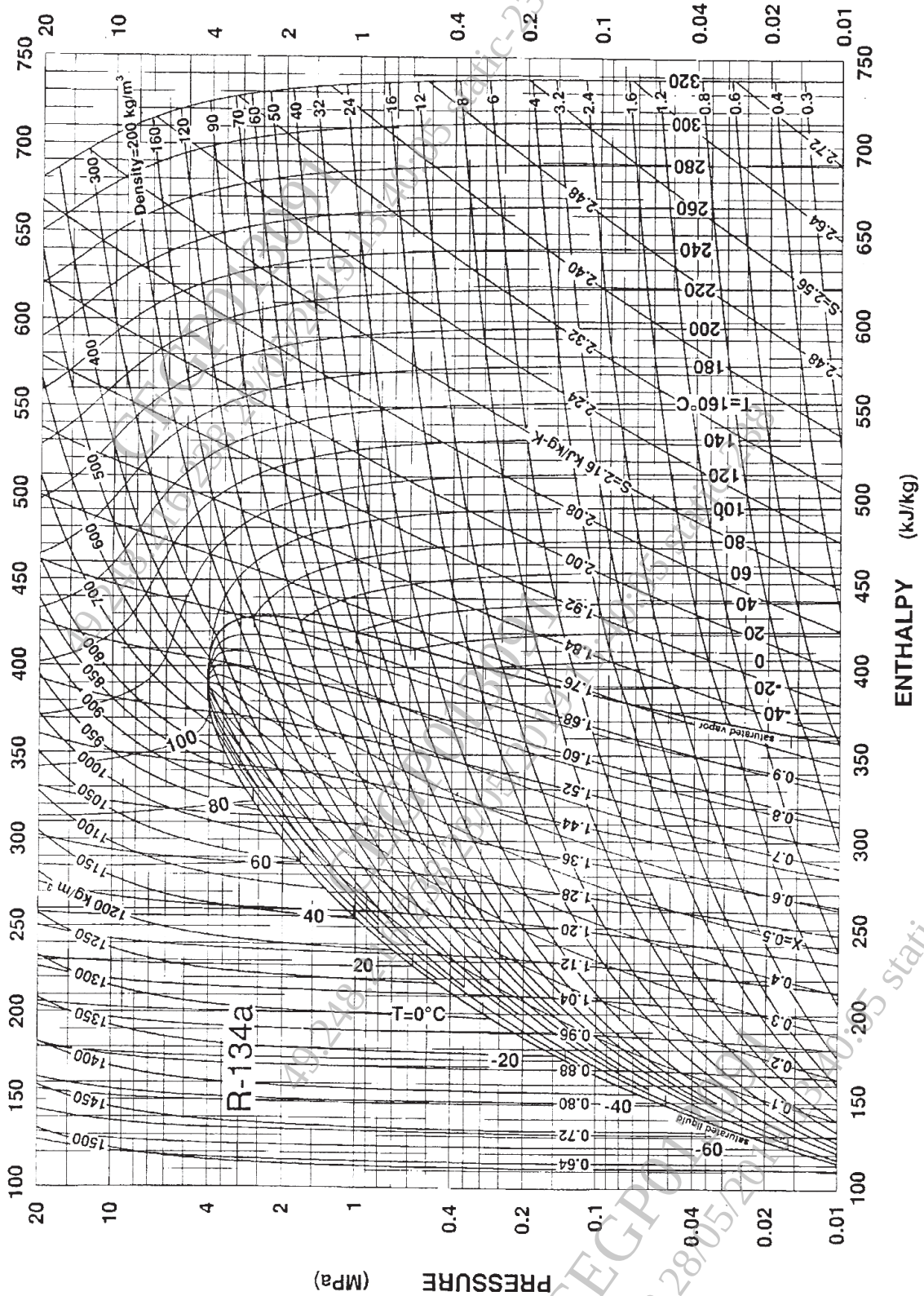
i) Elbow

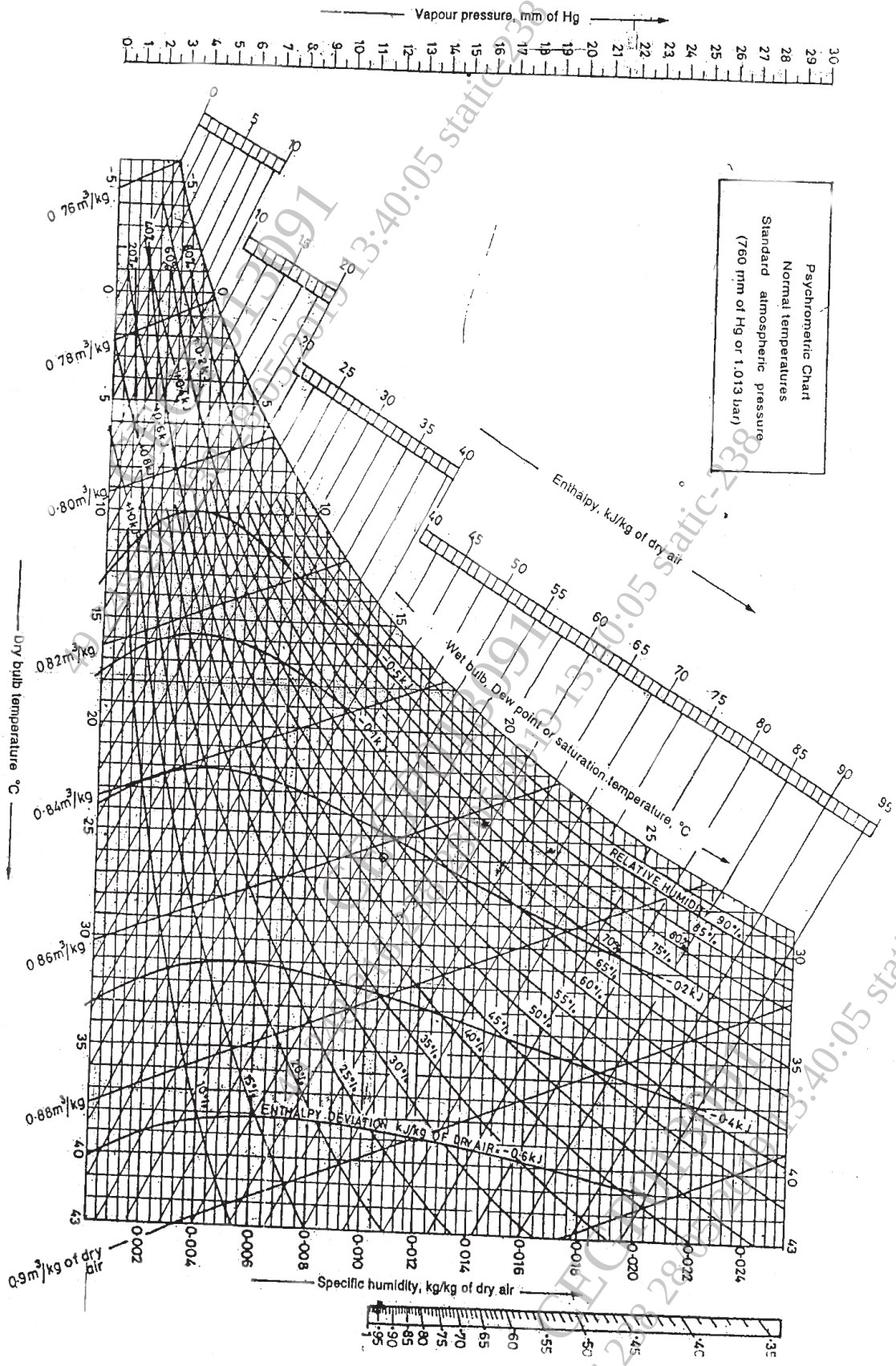
ii) Bends

iii) Tees

iv) Enlargement and contraction

v) Divided flow fittings.




Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
Vapour pressure, mm of Hg
Enthalpy, kJ/kg of dry air
Wet bulb, Dew point or saturation temperature, °C
Dry bulb temperature °C
Specific humidity, kg/kg of dry air
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR