Total No. of Questions : 10]

SEAT No. :

P4268

[Total No. of Pages : 5

[5353]-518
T.E. (Mechanical) (Semester - II)
REFRIGERATION & AIR CONDITIONING
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data if necessary and mention it clearly.***
4) ***Use of steam table is allowed.***

Q1) a) Explain commercial refrigeration for dairy products. **[6]**

b) Explain chemical properties of refrigerants. **[4]**

OR

Q2) a) Compare vapour compression and vapour absorption refrigeration system. **[4]**

b) A vapour compression refrigerator of 1 TR capacity works between the pressure of 5.3 bar and 2.1 bar. The vapour is superheated by 5°C before entering the compressor and superheated to 37°C at the end of compression. Find the COP of the plant and refrigerant mass flow rate. Take C_p of vapour 0.63 kJ/kgK. **[6]**

Sat. Pressure	Sat. Temp.	h_r	h_{fg}
Bar	°C	kJ/kg	kJ/kg
5.3	15.5	56.15	144.9
2.1	–14	25.12	158.7

Q3) a) Define : EER, SEER, IPLV and NPLV. **[4]**

b) Calculate percentage change in COP of the vapour absorption system when the generator temperature changes from 150°C to 200°C and refrigeration temperature changes from –20°C to –40°C. Condensation temperature remains same as 30°C. **[6]**

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OR

Q4) a) Derive equation of COP for the two stage compression with flash gas removal and liquid intercooler with schematic and P-h diagram. **[8]**

b) Mention any two applications of cryogenics. **[2]**

Q5) a) Explain air washer and possible psychometric processes with it. **[6]**

b) A mixture of dry air and water vapour is at a temperature of 21°C under a total pressure of 736 mm Hg. The dew point temperature is 15°C. Find: **[10]**

i) Partial pressure of water vapour

ii) Relative humidity

iii) Humidity ratio

iv) Enthalpy of air per kg of dry air

v) Specific volume of dry air per kg of dry air.

OR

Q6) a) Explain thermodynamic mechanism of human body. **[6]**

b) A commercial shop has following loads:

Room sensible heat : 58.15 kW

Room latent heat : 14.54 kW

The summer outside and inside design conditions are :

Outside: 40°C DBT, 27°C WBT

Inside: 25°C DBT, 50% RH

70m^3/min of ventilation air is used. Determine the following if the by-pass factor of the cooling coil is 0.15. **[10]**

i) Ventilation load

ii) Grand total heat

iii) Grand sensible heat factor

iv) Effective room sensible heat factor

v) Apparatus dew point

Q7) a) Explain with neat sketch winter air conditioning system. **[6]**

b) Explain with neat sketch air water system. **[6]**

c) Explain with neat sketch working of constant superheat expansion valve. **[6]**

OR

Q8) a) Explain with neat sketch central air conditioning system. **[6]**

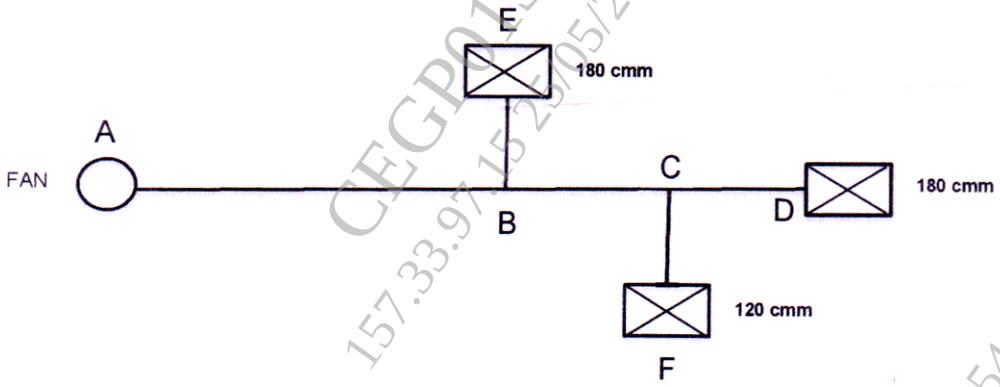
b) Explain with neat sketch working of constant pressure expansion valve. **[6]**

c) Explain with neat sketch scroll compressor. **[6]**

Q9) a) Derive an expression for equivalent diameter of circular duct corresponding to a rectangular duct of side a and b for same pressure loss per unit length when the discharge is same and when velocity is same. **[8]**

b) Using equal Friction method, determine the duct diameter and velocity for section AB, BD and BC.

Assume velocity in the main duct AB = 600m/min. also calculate maximum pressure drop in the duct system. Distance AB = 40m, BE= 10m, CF = 10m, BD = 40m. **[8]**

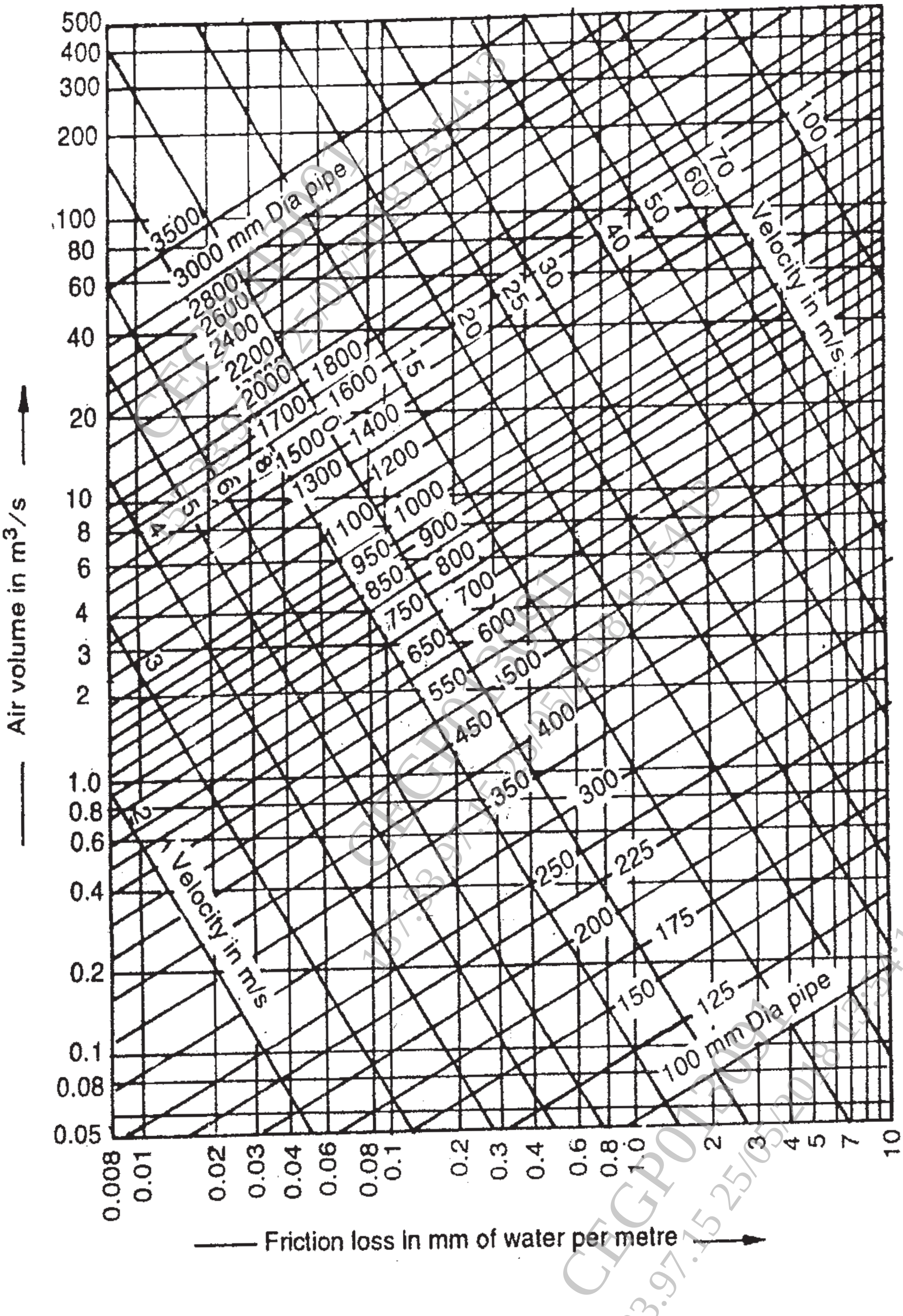


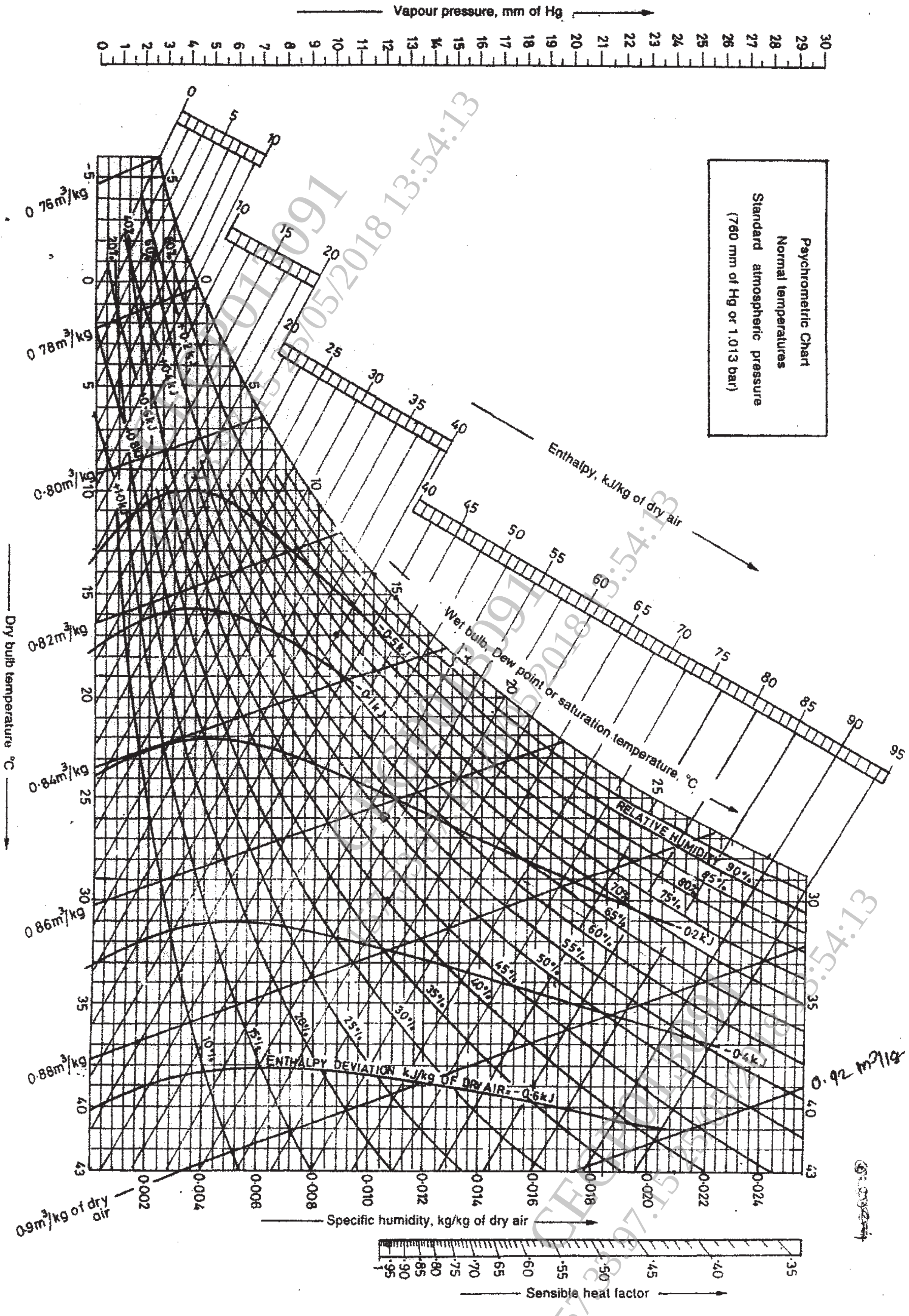
OR

Q10)a) A circular duct diameter 0.3m is 50 long and carries air of density 1.15 kg/m^3. If the flow is 2m^3/s. Find the total pressure at the inlet of the duct. Take f = 0.006. Also find air power. **[6]**

b) Explain static and velocity pressure in a duct. **[4]**

c) Explain types of supply outlets for distribution of air. **[6]**




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
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR
Dry bulb temperature °C
Specific humidity, kg/kg of dry air
Sensible heat factor
0.76 m³/kg
0.78 m³/kg
0.80 m³/kg
0.82 m³/kg
0.84 m³/kg
0.86 m³/kg
0.88 m³/kg
0.9 m³/kg of dry air
0.92 m³/kg