

Total No. of Questions : 8]

SEAT No. :

**P-643**

[Total No. of Pages : 6

**[6004]-604**

**B.E. (Mechanical)**

**Heating, Ventilation, Air Conditioning and Refrigeration**

**(2019 Pattern) (Semester - VII) (402041)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Scientific Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

**Q1) a)** Explain with neat sketch the flooded type evaporator. **[6]**

b) Explain with neat schematic diagram the frost control circuit used in VCR cycle. **[6]**

c) Explain with neat schematic CO<sub>2</sub> trans critical cycle. **[5]**

OR

**Q2) a)** Explain with a neat sketch Thermostatic Expansion Valve. **[5]**

b) Discuss the following terms used in thermodynamics analysis of Simple Ejector Refrigeration Cycle. **[6]**

i) Entrainment Ratio

ii) Entrainment efficiency

iii) Nozzle Efficiency

c) Explain with a neat sketch Low Pressure (LP) cut off used in VCR cycle. **[6]**

**P.T.O.**

- Q3) a)** Explain load calculations factors for air conditioning. (any four) [8]
- b) The air-handling unit of an air-conditioning plant supplies a total of 4500 cmm of dry air which comprises by weight 20% fresh air at 40°C DBT, 27°C WBT, and 80 % recirculated air at 25°C DBT and 50% RH. The air leaves the cooling coil at 13°C saturated state. Calculate the following [10]
- Total cooling load, and
  - Room heat gain.

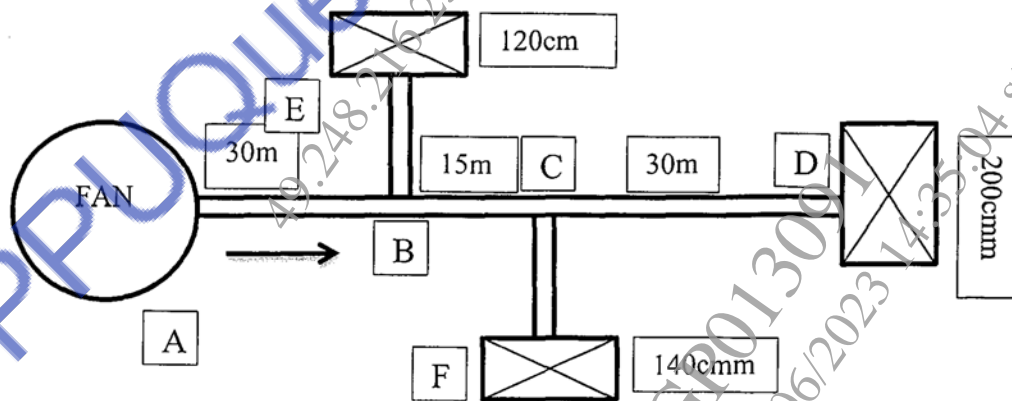
OR

- Q4) a)** Explain the terms : [6]
- GRSHF
  - BPF
  - ERSHF
- b) A conference room for sitting 100 persons is to be maintained at 22 °C DBT and 60% relative humidity. The outdoor conditions are 40 °C DBT and 27 °C WBT. The various loads in the auditorium are as follows: [12]
- Sensible and latent heat loads per person 80 W and 50 W respectively; lights and fans, 15000 W, sensible heat gain through glass ceiling etc. 15000 W.
- The air infiltration is 20 m<sup>3</sup>/min and fresh air supply is 100 m<sup>3</sup>/min.
- Two-third of recirculated room air and one-third of fresh air are mixed before entering the cooling coil.
- The bypass factor of the coil is 0.1.
- Determine
- Apparatus dew point,
  - Grand total heat load and
  - Effective room sensible heat factor.

- Q5) a)** What is infiltration and Ventilation? What are different Methods of Infiltration? [5]
- b)** A circular Duct of 400mm is selected to carry air at a velocity 440 m/min. If duct is replaced by rectangular Duct of aspect ratio 1.5. Find the size of rectangular Duct for equal friction when ; [7]
- i) Velocity in two Duct is same.
- ii) Discharge in two Duct is same.
- If  $f = 0.015$ , Find the pressure loss per 100m length of Duct. Take density of air =  $1.15 \text{ kg/m}^3$
- c)** Write a note on FAN Law, List the different types of fans used in air conditioning system, state applications. [6]

OR

- Q6) a)** Explain Natural Ventilation and Mechanical Ventilation. [4]
- b)** In the air duct system, as shown figure below, air enters at A with a static pressure of 7.5 mm of water. The branch B is 15 m long and delivers  $120 \text{ m}^3/\text{min}$ . The branch at C is 22.5 m long and delivers  $140 \text{ m}^3/\text{min}$ . At the end D of the main duct, the air delivered is  $200 \text{ m}^3/\text{min}$ . Using friction chart and equal pressure drop method determine the diameter and velocity pressure in lengths AB, BC, CD, BE, CF Duct sections. Consider friction losses only. [7]

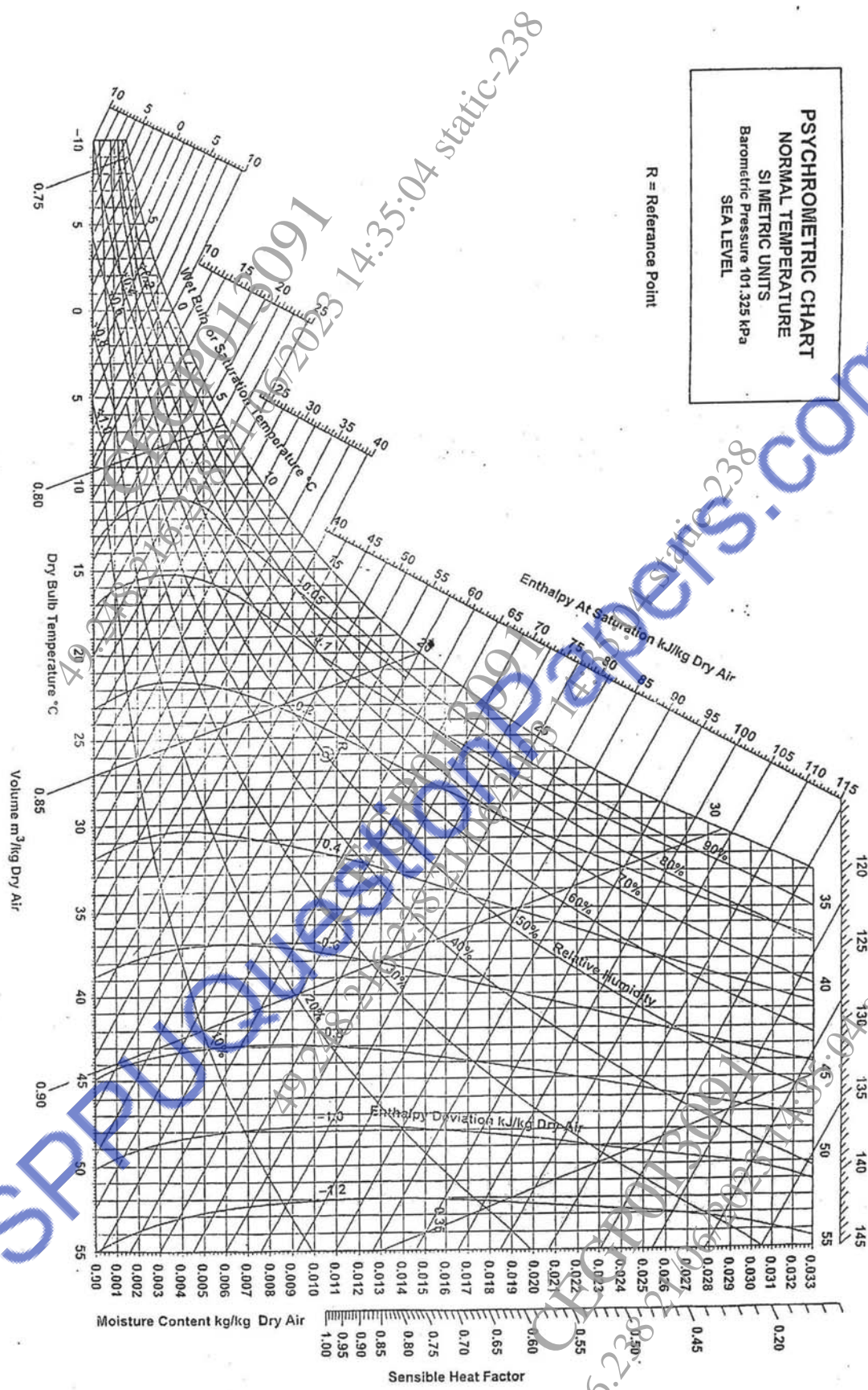


- c)** Define the following as applied to “Air Distribution System” Intake, Outlet, Grille, Register, Diffuser, Throw and Primary Air. [7]

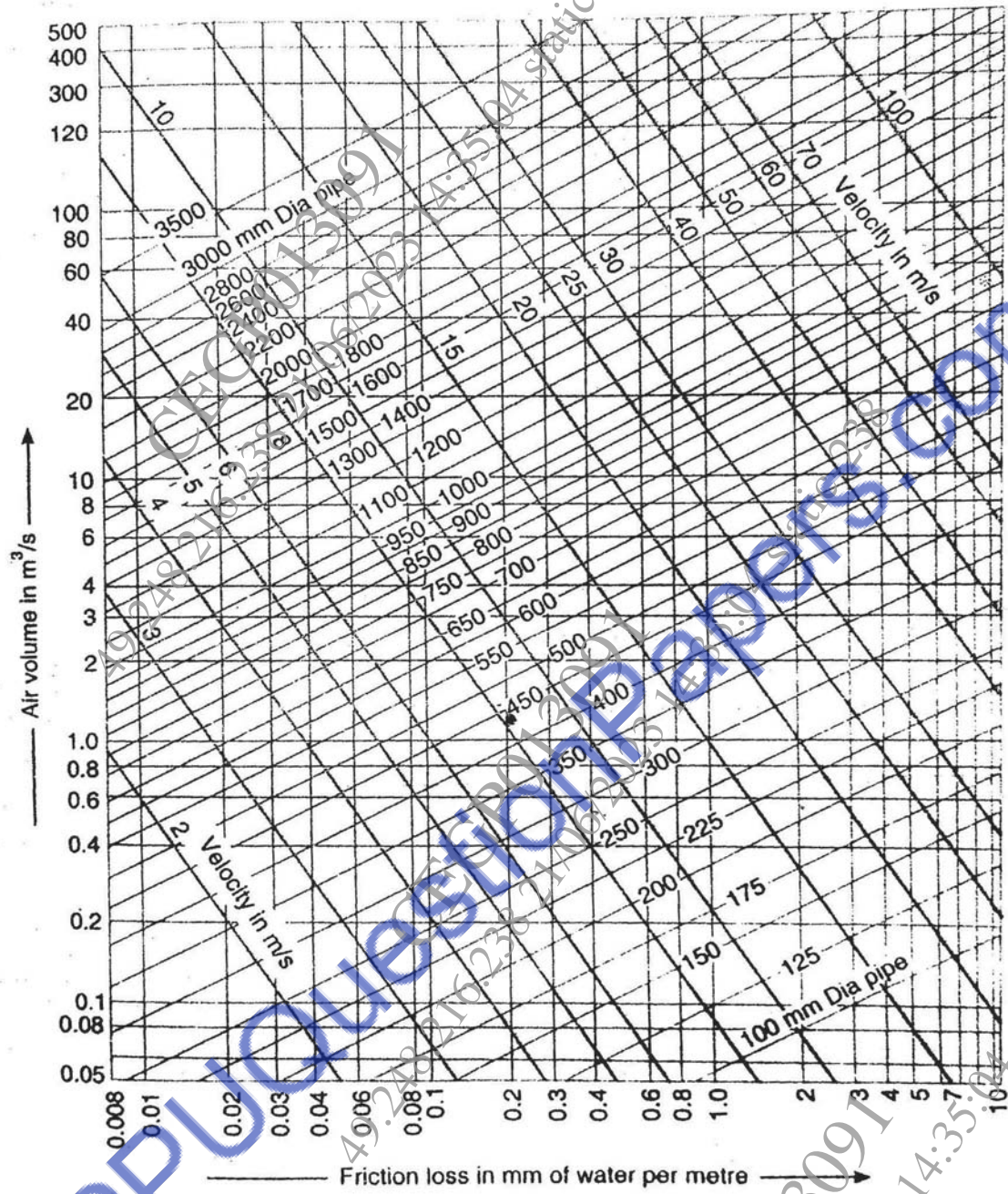
- Q7)** a) Explain with neat sketch winter Air conditioning system. [6]  
b) Draw and Explain water to water heat pump circuit. [6]  
c) Write a short note on solid packed tower. [5]

OR

- Q8)** a) Explain with neat sketch All water system. [6]  
b) Write a short note on Sorbents and Desiccants. [6]  
c) Write a short note on Radiant cooling. [5]



### Friction Chart for Circular Ducts



x

x

x