

Total No. of Questions : 8]

SEAT No. :

PA-960

[Total No. of Pages : 5

[5927]-412

B.E. (Mechanical & Automobile)

**HEATING, VENTILATION, AIR - CONDITIONING AND
REFRIGERATION**

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1) a)** Explain with a neat sketch Thermostatic Expansion Valve. **[5]**
- b)** Discuss the following terms used in thermodynamic 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]**

OR

- Q2) a)** Distinguish between the air cooled and water cooled condensers. **[4]**
- b)** Explain with neat schematic low temperature control in VCR cycle. **[6]**
- c)** Explain with neat schematic Simple Ejector Refrigeration System. **[7]**

- Q3) a)** What is CLTD method? How it connects with time lag and decrement factor? **[6]**
- b)** A commercial shop has following loads : **[12]**
- Room sensible heat : 58.15 kW
- Room latent heat : 14.54 kW

P.T.O.

The summer outside and inside design conditions are :

Outside : 40°C DBT, 27°C WBT

Inside 25°C DBT, 50% RH

70 m³/min of ventilation air is used. Determine the following if the by-pass factor of the cooling coil is 0.15.

- i) Ventilation load
- ii) Grand total heat
- iii) Grand sensible heat factor
- iv) Effective room sensible heat factor
- v) Apparatus dew point

OR

Q4) a) Explain the ASHARE comfort chart showing the comfort zones for winter and summer. Also explain factors (any two) affecting human comforts. **[10]**

b) Atmospheric air at 30°C dry bulb temperature and 75% relative humidity enters a cooling coil at a rate of 200m³/min. The coil dew point temperature is 14°C and the by-pass factor of the coil is 0.1. **[8]**

Determine :

- i) The temperature of air leaving the cooling coil;
- ii) The capacity of the cooling coil in tonnes of refrigeration and in kW
- iii) The amount of water vapour removed per minute; and
- iv) The sensible heat factor for the process.

Q5) a) What is infiltration and Ventilation? **[4]**

b) A Duct of Rectangular cross section 600mm × 400mm carries 90m³/min of air having density of 1.2kg/m³. Determine the equivalent diameter of the circular duct; **[8]**

- i) When the quantity of air carries in both the cases is same;
- ii) When velocity of air in both cases is same.

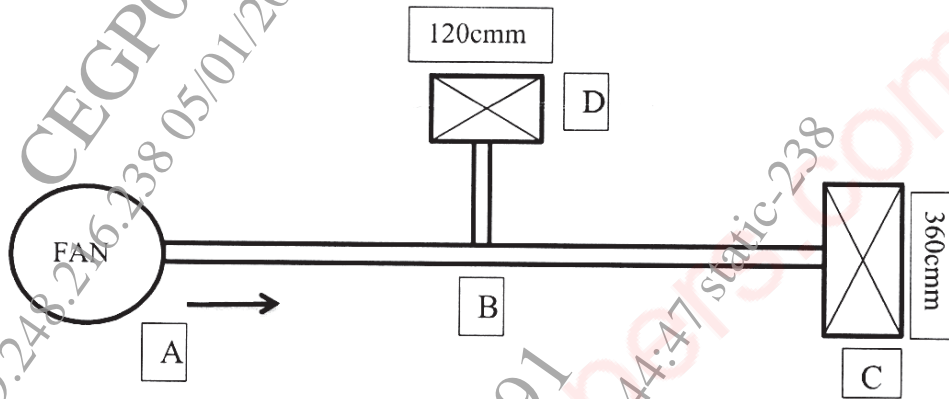
Take friction factor is 0.011. Also calculate pressure loss per 100m length of duct.

c) Explain Fan Coil System? Write application of various types of Fans. **[6]**

OR

Q6) a) What do you mean by Infiltration? Explain Natural Ventilation induced by wind. [5]

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 = 30m, Distance BC = 30m and Distance BD = 10m. Refer the figure as given below : [7]



c) Explain any two types of “Air Distribution System” used in Air Conditioning system. [6]

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

b) Explain Thermal storage air conditioning system. [6]

c) Write a short note on liquid spray tower. [5]

OR

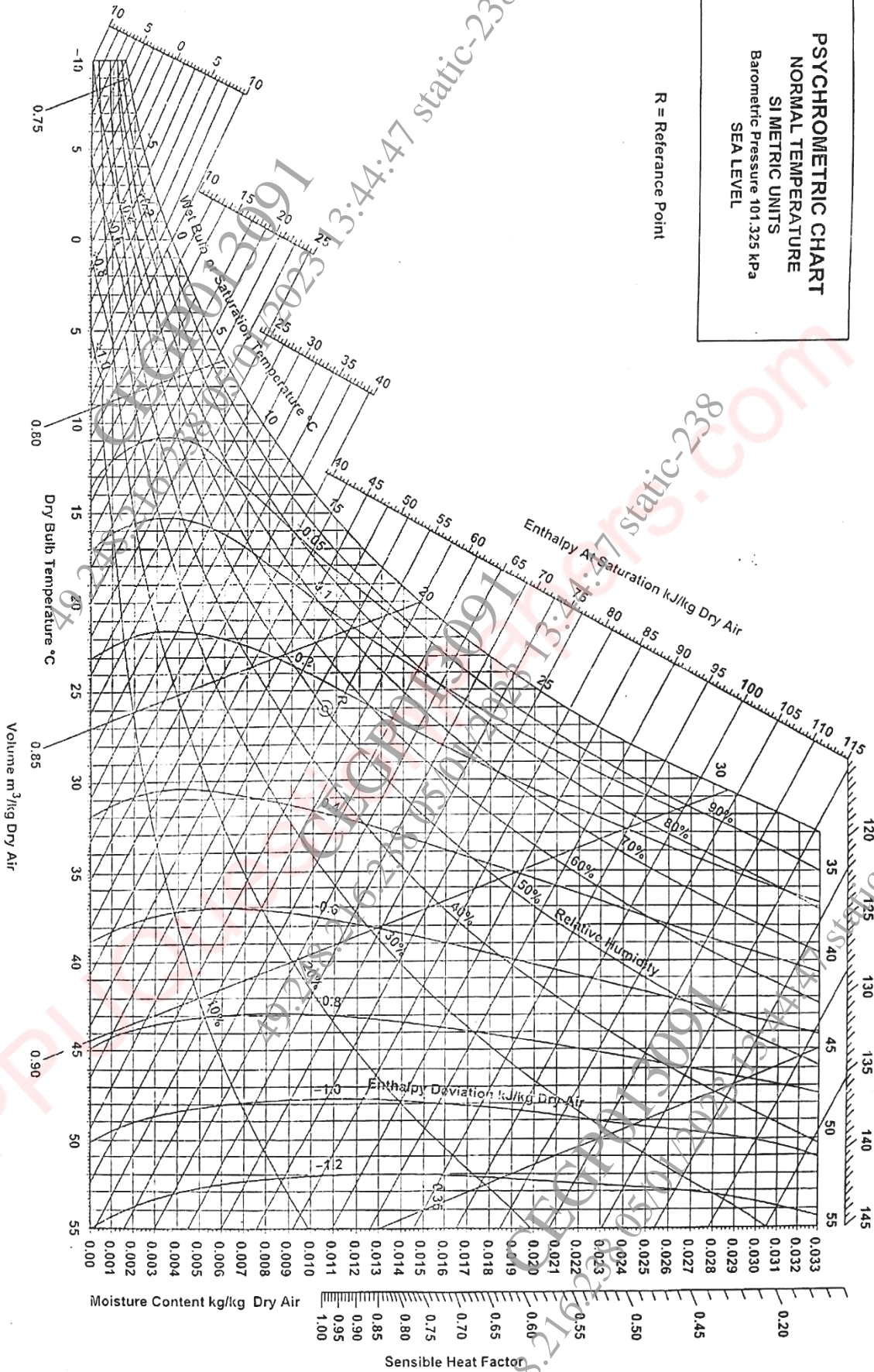
Q8) a) Explain with neat sketch central air conditioning system. [6]

b) Explain with neat diagram indirect evaporative cooling air conditioning system. [6]

c) Write a note on clean room air conditioning system. [5]

PSYCHROMETRIC CHART
NORMAL TEMPERATURE
SI METRIC UNITS
 Barometric Pressure 101.325 kPa
 SEA LEVEL

R = Reference Point



Friction Chart for Circular Ducts

