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[6181]-231

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 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 side 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.　　**[6]**

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

　　c)　Distinguish between the air cooled and water cooled condensers.　**[5]**

OR

Q2) a)　Explain with neat sketch flooded type evaporator.　　**[6]**

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

　　c)　Explain with neat schematic CO_2 transcritical cycle.　　**[5]**

Q3) a)　Explain load calculations factors for air conditioning.　　**[8]**

　　b)　Atmospheric air at 30°C dry bulb temperature and 75% relative humidity, enters a cooling coil at a rate of 200 m³/min. The coil dew point temperature is 14°C and the by-pass factor of the coil is 0.1. Determine :　　**[10]**

　　　i)　The temperature of air leaving the cooling coil;

　　　ii)　The capacity of the cooling coil in TR and in kW;

　　　iii)　The amount of water vapour removed per minute; and

　　　iv)　The sensible heat factor for the process.

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Q4) a) Explain the terms : **[9]**

    i) GRSHF

    ii) BPF

    iii) 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 : **[9]**

    i) Sensible and latent heat loads per person 80 W and 50 W respectively;

    ii) Lights and fans, 15000 W;

    iii) Sensible heat gain through glass ceiling etc. 15000W.

    iv) The air infiltration is 20 m³/min and fresh air supply is 100 m³/min.

    v) Two-third of recirculated room air and one-third of fresh air are mixed before entering the cooling coil.

    vi) The bypass factor of the coil is 0.1.

    Determine :

      a) Apparatus dew point,

      b) Grand total heat load and

      c) Effective room sensible heat factor

*Q5)* a) What is infiltration and Ventilation? What are different Methods of Infiltration? **[8]**

  b) A circular duct of φ400 mm 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: **[10]**

    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 kg/m³.

OR

Q6) a) Explain Natural Ventilation and Mechanical Ventilation. **[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 = 600 m/min. Also Calculate maximum pressure drop in the duct system. Distance AB = 30 m, Distance BC = 30 m and Distance BD = 10 m. Refer the figure as given below. **[10]**
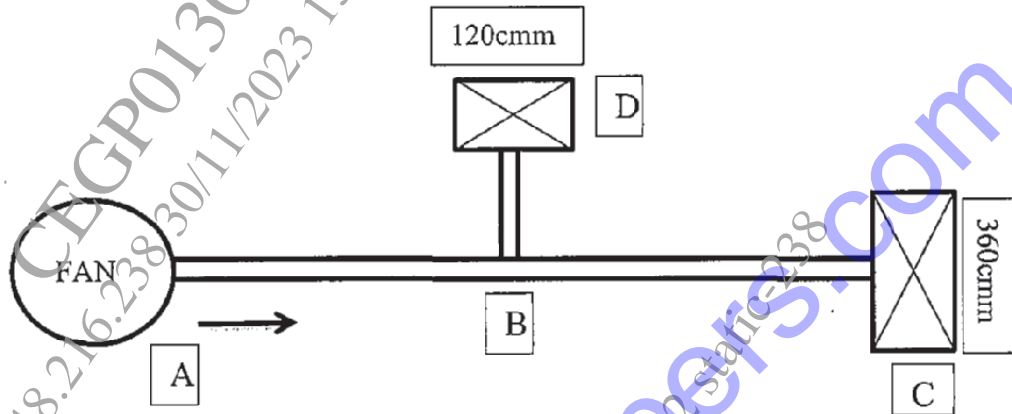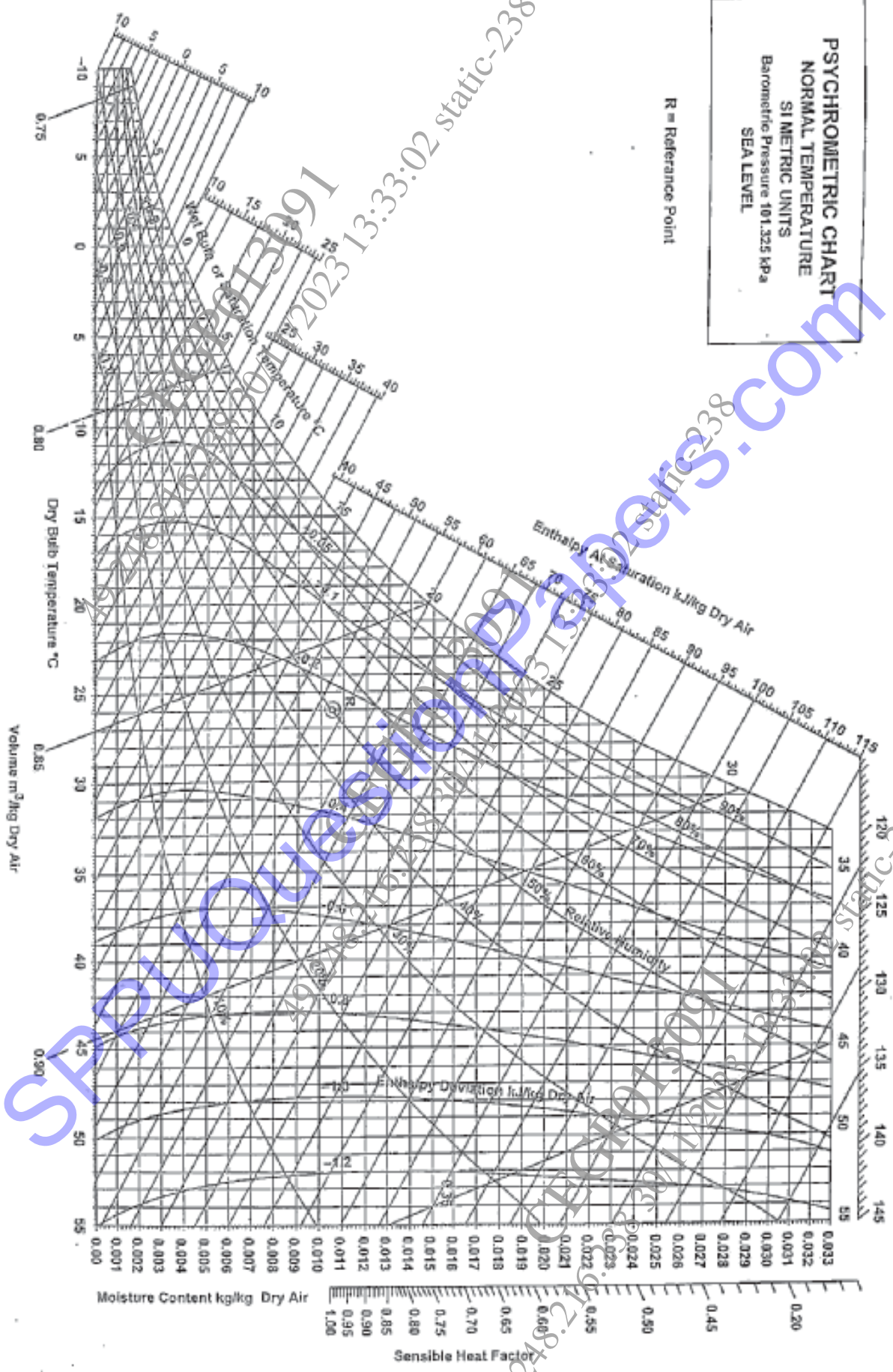

Q7) a) Explain with neat sketch winter Air conditioning system. **[6]**

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]**

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

R = Reference Point

Friction Chart for Circular Ducts

Friction Chart for Circular Ducts