Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2013

Subject code: 1722103 **Date: 31-12-2013**

Subject Name: Advanced Air Conditioning

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain the following **07**

(i) Enthalpy deviation

(ii) Difference between degree of saturation and relative humidity

(iii) Thermodynamic wet bulb temperature and temperature recorded by wet bulb thermometer

(b) State and explain the types of evaporative cooling system with sketch. **07**

Q.2 **(a)** The following information is available in connection with air conditioning of a store. **09**

Outside design condition: 41ºC DBT, 25ºC WBT

Inside design condition: 25ºC DBT, 50% RH

Room sensible heat gain:167.5 kW

Room latent heat gain 41.8 kW

Sensible heat from outside air: 57.9 kW

Air off the coil condition: 90% RH

With the help of psychrometric chart calculate RSHF (b) Room ADP (c) Temperature of air at coil exit (d) The capacity of the unit.

(b) Explain the procedure for calculating the cooling load due to infiltration air. **05**

OR

(b) Explain the following terms in relation with cooling tower **05**

(i) Cooling range

(ii) Approach

(iii) Effectiveness

(iv) Circulation rate

(v) Cooling factor

Q.3 **(a)** Explain the following terms in relation with fan **08**

(i) Static pressure

(ii) Velocity pressure

(iii) Fan air power

(iv) Static efficiency

(b) A fan delivers 600 m^3/min against 370 Pa static pressure with an outlet velocity of 600 m/min and a static efficiency of 75 %. Calculate (a) Total heat (b) Air power (c) Brake power (d) Mechanical efficiency. **06**

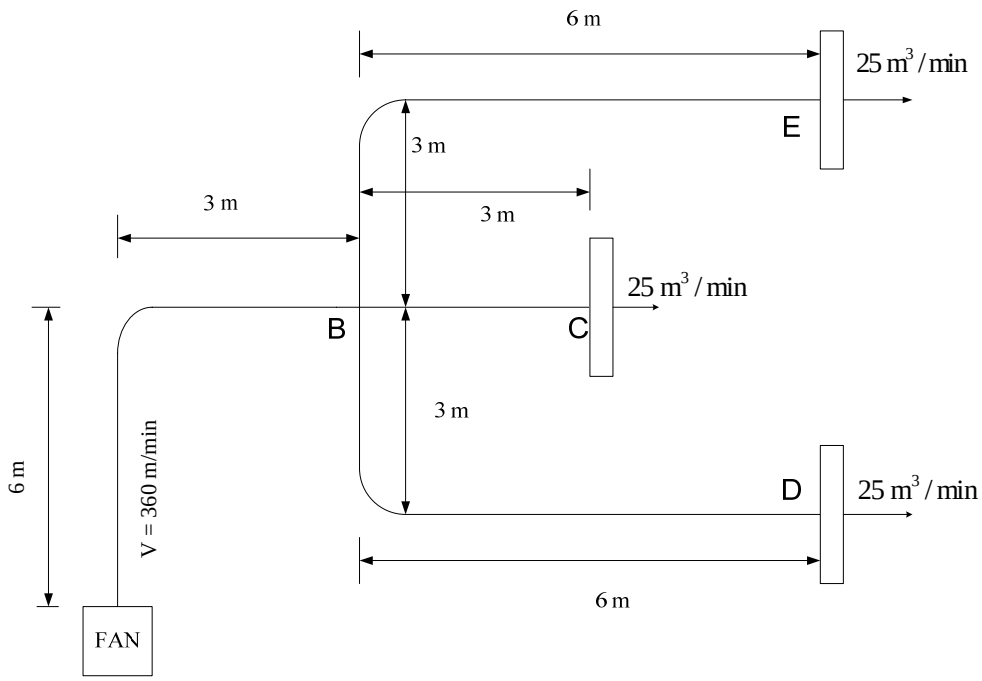
OR

Q.3 **(a)** What is the difference between grille and diffuser? Sketch the placement of different grill/ diffusers in the room for proper air distribution. Name each of them. **07**

(b) The following data is available for a conference room which is to be air conditioned. Room size: Length = 9 m, Breadth = 5 m and Height = 3m. Maximum room load: 30 W/m^2, Height of the occupied zone: 1.4 m. Select the suitable grille. **07**

Q.4 **(a)** Explain the static regain method of duct design. **07**

(b) Figure shows the duct layout. Find the sizes of various duct and maximum pressure loss by equal friction method. Assume that the dynamic loss at each bend/area change is equivalent to the duct length of 2 m. Velocity of air at fan outlet is 360 m/min. Take $h_f = 0.02(L/D)(V/77.5)^2 Pa$ with usual notations. **07**



OR

Q.4 **(a)** Enumerate the various dynamic losses which take place and how losses of pressure due to them are calculated. **07**

(b) A duct is required to handle 400 L/s of standard air. (i) Calculate the size of the rectangular duct (ii) Compare the mean velocities of circular and rectangular duct. Take pressure drop of 3 Pa/unit length. **07**

Q.5 **(a)** Explain the working principle of Viscous Impingement Filter and Dry Screen Filter. **07**

(b) What is sound insulation? Discuss the factors on which good sound insulation depends. **07**

OR

Q.5 **(a)** Write a short note on Effective temperature and comfort zone. What are the limitations of comfort chart? **07**

(b) Write a short note on human body temperature regulation. **07**

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