

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

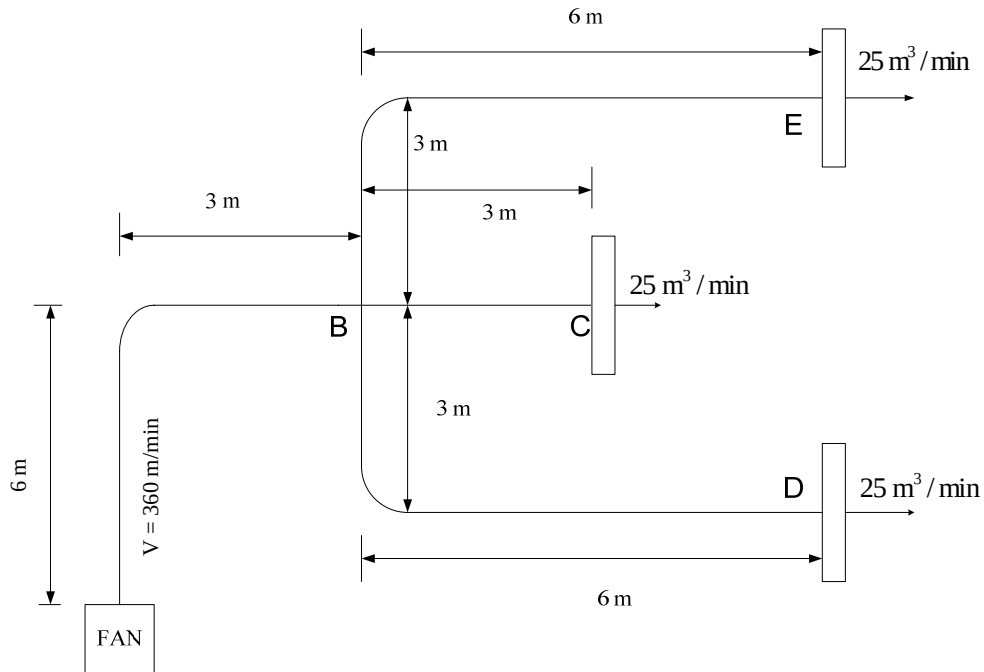
Total Marks: 70

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: 41°C DBT, 25°C WBT
Inside design condition: 25°C 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 m³/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/m², 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 $h_f = 0.02(L/D)(V/77.5)^2 \text{ Pa}$ 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**
