Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 1722103 **Date: 19/05/2016**

Subject Name: Advanced Air Conditioning

Time:10:30 am to 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)** Define the following **04**

1. Enthalpy of moist air
2. Thermodynamic Wet bulb temperature
3. Absolute humidity
4. Specific volume of moist air

(b) Draw the psychrometric chart and show on it the various processes those can be carried out in Air washer. **03**

(c) With neat sketch and psychrometric chart, describe a DX type air conditioning system. **07**

Q.2 **(a)** An air conditioned auditorium is to be maintained at 27°C DBT and 60% RH. The ambient condition is 40°C DBT and 30°C WBT. The sensible heat load is 100000kJ/h and the total heat load is 40000kJ/h. 60% of the return air is recirculated and mixed with 40% of makeup air after the cooling coil. The condition of air leaving the cooling coil is at 18°C. Determine (1) Room sensible heat factor (2) The condition of air entering the auditorium (3) The amount of makeup air (4) Apparatus dew point (5) Bypass factor of the cooling coil. **07**

(b) What is the difference between infiltration and ventilation? Explain how you will calculate the load due to Infiltration and Ventilation. **07**

OR

(b) Explain the construction and working of a natural draught cooling tower. State its merits and demerits. **07**

Q.3 **(a)** Define the following **03**

1. Fan total pressure
2. Fan static pressure
3. Velocity pressure

(b) Explain the arrangement of two fans in series and in parallel with the help of combined characteristics of both the fans. **04**

(c) A fan delivers 300 m^3/min at static pressure of 500 Pa at 800 rpm. The fan draws 5 kW power. Calculate (1) discharge (2) static pressure (3) power if the speed of fan is increased to 880 rpm. **07**

OR

Q.3 **(a)** Define the following terms in relation with air distribution system. **07**

1. Draft
2. Stufiness
3. Induction
4. Gross area of Grill
5. Primary air
6. Outlet velocity
7. Temperature differential

(b) What is the difference between Grill and Diffuser? Sketch the placement of different grills and diffusers in the room for proper air distribution. Give name of each. **07**

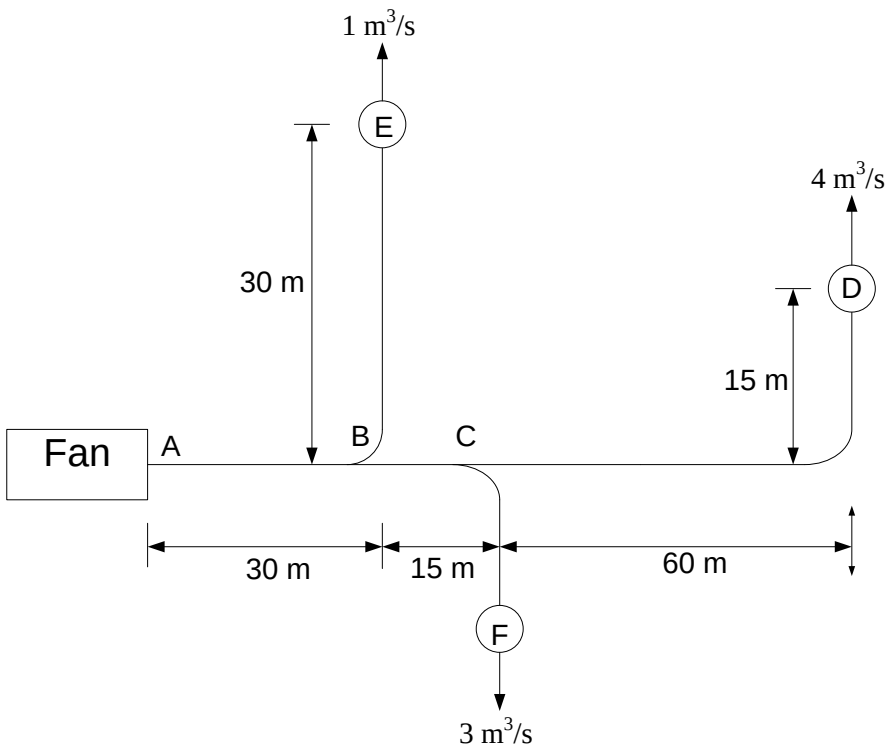
Q.4 **(a)** Explain the use of Nomographs and Equivalent Diameter Chart for the design of air conditioning duct. **07**

(b) An air conditioning duct runs straight from fan over 60 m length. It has four equally spaced outlet diffusers mounted on duct, the last one being at the end of duct. The volume flow rate through each diffuser is 1 m^3/s. The velocity at the duct inlet is 15 m/s. carry out the duct design by static regain method if the static regain factor is 0.75 at each transition and frictional pressure drop is given by **07**

$$\frac{\Delta p_f}{L} = \frac{0.002268\dot{Q}_v^{1.852}}{D^{4.973}} \text{ and } \Delta p_v = \left(\frac{C}{4.04}\right)^2$$

OR

Q.4 **(a)** For an air duct system as shown in figure, determine the dimensions of AB, BC, and CD using the equal friction method. **07**



Use the following formula for friction rate:

$$\frac{\Delta p_f}{L} = \frac{0.002268\dot{Q}_v^{1.852}}{D^{4.973}}$$

Where the value of friction is 0.08 mm H_2O/m length of duct.

(b) Explain how the dynamic losses are calculated in duct design? **07**

Q.5 **(a)** What is a noise criterion curve? Explain its use with a neat sketch. **07**

(b) What is clean room? Give detail classification of clean room. **07**

OR

Q.5 **(a)** With the help of neat sketch, explain the working of automatic type viscous filter. **07**

(b) Explain the factors governing human comfort. **07**

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