Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Examination July 2010

Subject code: 721003 **Subject Name: Advanced Air-Conditioning**

Date: 07 /07 /2010 **Time: 11.00am – 1.30pm**

Instructions: **Total Marks: 60**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of student's own tables and charts are allowed.**

Q.1 **(a)** Draw the skeleton of psychometric chart with necessary notations and show the GSHF, ESHF and RSHF on it. Also mention the relation between them. **06**

(b) Explain: (i) By-pass factor (ii) Effectiveness of cooling tower (iii) flywheel effect of building material. **06**

Q.2 **(a)** Write a short note on outlet locations for different specific air conditioning applications. **06**

(b) Compare all air systems with air water systems. **06**

OR

(b) Explain dual duct VAV system with neat sketch and represent it on psychometric diagram. **06**

Q.3 **(a)** Explain the procedure of fan testing as per IS standards. **06**

(b) What is acoustic rating? Explain methods of accessing noise including SIL, NC, NR, and RC. **06**

OR

Q.3 A simple duct system is shown in fig. 1. Size the sections by the equal friction method. The rectangular duct sections sized by the equal friction method should not have a depth exceeding 400 mm. Estimate the pressure loss in the system neglecting the loss due to system effect at the fan inlet. The static loss at each terminal on the duct is 40 pa. Use your own tables and charts. Assume velocity of air at fan outlet as 9m/s. **12**

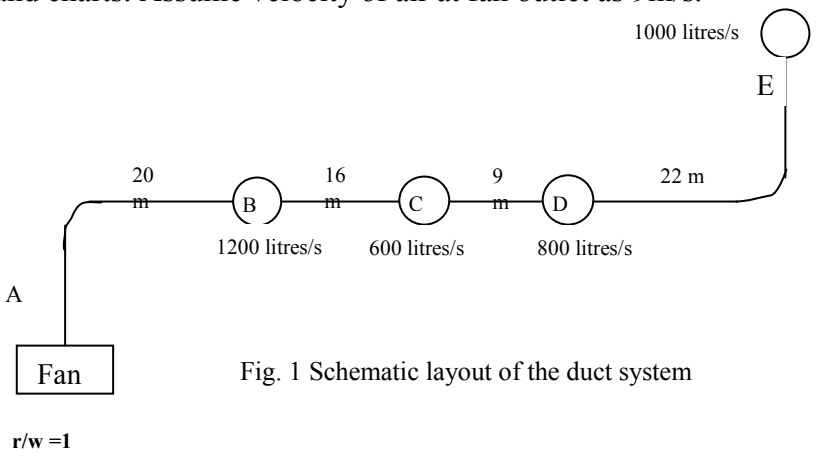

Fig. 1 Schematic layout of the duct system

Q.4 **(a)** Derive the equation for the cooling tower characteristics for counter flow type cooling tower. **06**

(b) A cooling tower cools 1,00,000 litres/hr of water required at 46°C. The air enters the tower at 37°C DBT and 30 % RH. It leaves the tower at 43°C DBT, 95% RH. If the cold water temperature is 33°C, calculate the air flow rate, effectiveness and make up water required. Take enthalpy of air leaving the tower is 185 kJ/kg. **06**

OR

Q.4 **(a)** The following data is available for a room to be air conditioned : **09**

Outside design condition : 28°C DBT, 20°C WBT
Inside design condition : 21°C DBT, 50% RH
RSH = 11.63kW, coil ADP = 7°C
Room ADP = 7.8°C, Coil BF = 0.26, Cp of moist air 1.0216 kJ/kg K.
Calculate (i) condition of air entering the coil (ii) RSHF (iii) condition of air entering the room (iv) mass of air supplied kg/hr (v) coil capacity (vi) room latent heat load. *Draw the Process on psychometric chart and attach it with your answer sheet.*

(b) Explain selection of cooling tower in short. **03**

Q.5 The following data is available for a room. Calculate the instantaneous cooling load through a roof at 4 PM. The following data be used : **12**

Outside design condition : 43°C DBT, 27°C WBT
Inside design condition : 26°C DBT, 50% RH
U_{roof} = 2.7 W/m^2 K, Mass of the roof : 390.6 kg/m^2
Correction in TETD = 6.4°C
Time lag = 5 hrs.
Roof area = 20m X 20m
Roof position: Sunlit and shaded, for 40°N latitude, July 21.

OR

Q.5 **(a)** Explain Effective temperature in relation with human comfort. Also explain factors governing effective temperature. **06**

(b) Enlist the different loads on residential building and Explain how to calculate the cooling load for residential buildings. **06**

****