Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1721003 **Date: 20-06-2014**

Subject Name: Advanced Air-conditioning

Time: 02:30 pm - 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of standard psychrometric charts and tables is permitted.**

Q.1 **(a)** A centrifugal fan of outlet 90 cm by 70 cm moves standard air at the rate of 680 m^3/ min through a system which consists of straight inlet and outlet ducts. The inlet duct is 90 cm in diameter and 60 m long. There is a diffuser between fan discharge and the 100 cm diameter duct for which the loss of pressure may be taken as 0.3 times the difference between velocity pressures. The loss at entry to the inlet duct is 0.5 times of the velocity pressure there and friction factor for duct is 0.004 and for the out let duct is 0.0035. Determine (1) fan total pressure (2) static pressure at the fan inlet and outlet. (3) Plot variation of total pressure and static pressure along the system. Assume air is sucked in by the inlet duct and delivered by the out let duct at atmospheric pressure. **07**

(b) A cooling tower is to be designed to cool 1,40,000 Kg/hr of water received at 49°C. The air entering the bottom of the tower is 1,00,000 Kg/hr at 30 °C DBT with 95% RH find the temperature to which water is cooled and estimate loss of water/hr. **07**

Q.2 **(a)** Write brief note on method of human body temperature regulation. **07**

(b) Atmospheric air at 35 °C and 60% R.H. is conditioned to 22 °C DBT and 55% RH. This is done first by cooling and dehumidifying and then heating. If the quantity of air flow is 60 cu. m per minute. Calculate capacity of cooling coil, heating coil and weight of water drained. **07**

OR

(b) A room is to be cooled using a desert cooler having humidification efficiency of 70% in desert area where the environmental condition is DBT 45°C and humidity 15%. The room size is 10m x 5m x 4m height. Electrical appliances and occupancy heat load amounts 3KW, over heat transfer coefficient for wall is 0.95 W/m^2 °C and of ceiling is 2.5 W/m^2 °C. The air leaves the room at 3 °C above inlet temperature. Determine (1) volume of air to be humidified, (2) water vapour evaporated per 8 hours of operation (3) size of desert cooler and (4) fan power if the pressure rise across the fan is 3 mm of water. The velocity of air across the desert cooler is 0.75 m/s and fan efficiency is 60%. **07**

Q.3 **(a)** Differentiate between the following: **07**

1. Cooling load calculation and heating load calculation
2. ASHRVE and CARRIER charts
3. I.H.G. and I.C.L.

(b) Explain method of heat load calculation for air-conditioning the conference hall at a specific location. **07**

OR

Q.3 **(a)** Explain the following: solï air temperature, Equivalent temperature differential, TETD correction, flywheel effect in buildings. **07**

(b) Classify and compare different methods duct design. **07**

Q.4	**(a)**	With neat sketch explain dual duct VAV systems.	**07**
	(b)	Explain following terms: Effective temperature, comfort zone, indoor air quality its selection and importance.	**07**

OR

Q.4	**(a)**	Explain DX systems. With neat sketch explain its salient features.	**07**
	(b)	Explain selection of air outlets in air handling systems.	**07**
Q.5	**(a)**	Classify, compare and explain selection of different types of air handling units for central air conditioning system.	**07**
	(b)	State factors influencing cooling tower performance and design considerations of cooling tower.	**07**

OR

Q.5	**(a)**	With neat sketch explain dual duct VAV systems.	**07**
	(b)	Explain the following: Fan laws, fan selection, testing of fan as per I.S.	**07**

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