Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME- SEMESTER II– EXAMINATION – SUMMER 2015

Subject Code: 2721003 **Date: 30/05/2015**

Subject Name: Advanced Air-conditioning

Time: 2:30 PM – 5:00 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 refrigeration air conditioning chart and table is permitted.**

Q.1 **(a)** A departmental store presents the following data **07**

RSH=116 k W, RLH=35k W

Room design condition=26 °C DBT, 55% RH

Outside design condition=35° C DBT, 29 C WBT

Ventilation air through conditioner=150m^3/min

Using psychrometric chart calculate(1) room ADP(2) Temperature of air off the coil(3) total quantity of air required(4)air on the coil temperature(5)coil apparatus dew point temperature assume B.F=0.2

(b) A main circular duct consisting of three branch ducts taking equal air volume at equal intervals. Each interval duct has a friction loss of 1.2 mm of water and state pressure of 4 mm of H_20 is necessary at each branch to cope up with friction loss. If the initial velocity in the main duct of 1.3 m diameter is 9 m/s. calculate velocities and diameters of second and third lengths where the static pressure regain is sufficient to overcome the friction loss in succeeding length of main duct up to the next branch. Assume static pressure regain factor of 0.58 and gain in velocity pressure equivalent is equivalent to pressure loss along the flow. Also calculate static and velocity pressures at appropriate points along the flow. **07**

Q.2 **(a)** Air at 26 °C DBT and 60% RH is required for some industrial purpose when outdoor condition is 42 °C DBT and 29 C WBT. The quantity of air required is 500m^3/min. The required condition is achieved first by cooling and dehumidifying and then by heating. The DBT of cooling coil is 10 °C Calculate **07**

1. Cooling coil capacity in TR and its B.F.
2. Quantity of steam required per hour at 2 bar saturated which is used for heating, assuming only latent heat is used
3. Capacity of the eliminator

(b) A centrifugal fan 910 mm in diameter operates at 8 RPS when handling air at temperature of 20°C. With a corresponding total pressure development of 600 N/m^3 and shaft power of 3k W. If the fan is used for heating purpose and fan handles air at temperature of 50°C, calculate the total pressure developed and fan power under these new conditions. If it is desired to keep the total pressure developed constant when the air handled is at a temperature of 50°C, calculate the fan speed, the air volume handled and the fan power given that the volume handled at 16°C was 5m^3/s. The density of air at 16°C is 1.22 kg/m^3 at standard atmospheric pressure. **07**

OR

	(b)	Draw a line diagram to illustrate the control dampers, cooling coils, heaters and fan with the help of thermostats and humidiostats in case of all year air conditioning system.	**07**
Q.3	**(a)**	Explain different types of outlets. What are grills and registers? State factors affecting grill performance.	**07**
	(b)	State and explain causes of vertical temperature gradient and their corrective measures in air-conditioning system.	**07**
		OR	
Q.3	**(a)**	Explain the following terms: throw, drop, induction ratio, spread.	**07**
	(b)	Compare all air, all water and air water system.	**07**
Q.4	**(a)**	Explain the following systems DX, VAV and dual duct system.	**07**
	(b)	Explain testing of air coolers as per B.I.S.	**07**
		OR	
Q.4	**(a)**	Define human comfort and explain factors which affect human comfort.	**07**
	(b)	Explain method of heat load calculation for air conditioning of a busy bank at specific location.	**07**
Q.5	**(a)**	Draw a neat diagram of a heating system used for heating a group of buildings showing all components of system.	**07**
	(b)	Compare cooling tower and evaporative condenser.	**07**
		OR	
Q.5	**(a)**	Explain Ventilation with Radiant Heating and Cooling systems and method of optimizing its performance.	**07**
	(b)	Explain roof top systems with neat sketches.	**07**

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