Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER II EXAMINATION – SUMMER 2017

Subject Code: 2721003 **Date:29/05/2017**

Subject Name: Advanced Air- conditioning

Time:02:30 PM to 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 psychometric tables and charts is permitted**

Q.1 **(a)** Outside air is being cooled to 17 °C, DBT 95%RH. The air then enters to silica gel dehumidifier. The specific humidity leaving the dehumidifier is 3gm/kg of dry air. The air is then cooled with a cooling coil through which the water is flowing. The temperature of water entering the cooling coil is the same as the mean surface temperature and is equal to 10 °C, The bypass factor for cooling coil is 0.3. The cooled air is mixed with room air in the ratio of 1/3 rd cooled air to 2/3rd room air. The mixed air is being cooled and humidified with an evaporative cooler where the water is completely recirculated. The humidifying efficiency of the evaporative cooler is 60%. The room sensible heat load is 2.84k W. The temperature of the heated water leaving the cooling coil is 3 °C less than the outlet temperature of air. Calculate **07**

(1) The rate of air flow in Kg/hr.
(2) Room sensible heat factor.
(3) The amount of water flow in evaporator cooler.

Take room design condition as 21 °C DBT, 60 % R.H.

(b) A coil 30 m long made from 15 mm medium grade steel tube is sandwiched between two vertical steel panels of size 2.5m x 1.25m. The coil has a temperature of 116 °C and operates with temperature drop between flow and return of 55 °C. **07**

(1) Calculate the emission from panel to the space having an air temperature of 16 °C.
(2) Calculate the water flow rate through the coil

Assume emissivity =0.92 and heat lost by convection $Q=1.9(\Delta T)^{1.25} W/m^2$

Q.2 **(a)** The room design conditions are 25 C DBT and 50 % RH, when outside air design conditions are 43C DBT and 27.5 WBT. The room sensible and latent heat loads are 20 kW and 5 k W resply. The 80% return air is mixed with 20 % fresh air and then passed through a cooling coil of 0.15 by pass factor. Determine (1) Apparatus dew point temperature (2) Condition of air leaving cooling coil (3)air flow rate into the room in m^3/sec (4) flow rate of fresh air and recirculated air in m^3/min (4) Refrigeration load of air conditioning plant. **07**

(b) Derive the equation for the cooling tower characteristics for counter flow type cooling tower. **07**

OR

(b) With neat sketch explain construction and working of air washer. **07**

Q.3 **(a)** What are the advantages and disadvantages of air water system over constant volume and variable volume all air system **07**

(b) Write short note on characteristic curves of forward curved centrifugal fans. **07**

OR

Q.3	(a)	With neat sketch explain construction and working of indirect evaporative coolers.	07
	(b)	Explain different methods of noise reduction in air conditioning systems	07
Q.4	(a)	List various sensors used in air conditioning systems. Sketch a line diagram and explain location of various sensors in an air conditioning system.	07
	(b)	Explain design considerations for selection of air filters.	07
		OR	
Q.4	(a)	Explain the following terms: still supply, ceiling diffuser, diffuser, induction ratio, and drop.	07
	(b)	What are different methods used for designing the ducts. Explain the advantages of each over others.	07
Q.5	(a)	Write brief note thermal comfort chart.	07
	(b)	With neat sketches explain different types of Evaporative coolers.	07
		OR	
Q.5	(a)	Compare all air and all water system and their applications.	07
	(b)	Explain following terms: TETD, ESHF, GSHF, VAV Systems.	07

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