Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER 2012

Subject code: 1721004 Date: 02-01-2013

Subject Name: Radiation Heating and Cooling System

Time: 10.30 am – 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)**	Explain following terms briefly. (i) Radiant Cooling (ii) Mean Radiant Temperature	**07**
	(b)	Describe methodology for solving the mass conservation and energy conservation equations for a typical HVAC situation.	**07**
Q.2	**(a)**	Differentiate between Forced Air Heating system and Radiative Heating System with proper illustrations.	**07**
	(b)	A 25 mm outside diameter pipe carries chilled water of 277 K. Another pipe of 50 mm outside diameter and at 300 K surrounds it coaxially and the space between the pipes is evacuated. Determine the radiant heat flow for 3 m long pipe if surface emissivity for both surfaces is 0.215. Also calculate percentage reduction in heat flow if a shield of 38 mm diameter and 0.05 surface emissivity is placed between the pipes.	**07**
		OR	
	(b)	In a room six people are working and average heat added to the room by them is 120 W. The ventilation system provides 1.2 kg/s of air at 20^0 C. The total heat transferred from the room to the surroundings at a rate of 135 W. If the heat added by electrical accessories is 650 W, calculate the temperature of the air in the room.	**07**
Q.3	**(a)**	Define Radiant Panel. Also describe its radiant characteristics.	**07**
	(b)	Explain Plank's law and Wien's displacement law applied to radiant energy transfer phenomenon.	**07**
		OR	
Q.3	**(a)**	Explain following terms as characteristics of building materials. (i) Emissivity (ii) Absorptivity (iii) Transmissivity	**07**
	(b)	Describe briefly Spherical Harmonics and Monte Carlo methods as solution techniques for solving the Radiative Transfer Equations (RTE).	**07**
Q.4	**(a)**	Explain Gagge two node thermal comfort model with figure.	**07**
	(b)	Describe design considerations for electric radiant heating panels.	**07**
		OR	
Q.4	**(a)**	Distinguish between Configuration factor and Interchange factor.	**07**
Q.4	**(b)**	Describe simplified Radiant Transport Function with schematic diagram.	**07**
Q.5	**(a)**	Describe about concept of 'The Operative Temperature'. Also explain its measurement techniques.	**07**
	(b)	Enumerate the different types of temperature controls used for radiant systems. Explain working of any one with figure.	**07**
		OR	
Q.5	**(a)**	Write short note on Modified Degree-Day method.	**07**
	(b)	Define concept of energy balance in context to Radiant Cooling. Describe the important characteristics of control volume.	**07**

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