GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER II (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 1721004   **Date: 20/05/2016**

Subject Name: Radiation Heating & Cooling system

Time:10:30 am to 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 concept of the Operative Temperature in terms of MRT and DBT.	**07**
	(b)	Explain the common factors affect on operating cost of Radiant heating system.	**07**
Q.2	**(a)**	Explain the concept of Multimodal Heat Transfer with necessary figure.	**07**
	(b)	Write rate form of the energy conservation equation with usual annotations along with the necessary assumptions.	**07**

OR

	(b)	Write the merits and demerits of R.T.E. as the most general approach for radiative heat transfer.	**07**
Q.3	**(a)**	What assumptions are made to form Binary Star Model of thermal circuit? Also explain the model by neat figure.	**07**
	(b)	Describe significance of the variables used to predict thermal comfort.	**07**

OR

Q.3	**(a)**	Draw and explain the PMV scale suggested by Fanger to analyze thermal sensation.	**07**
	(b)	Explain about the factors affecting the rate of radiant heat transfer in the built environment.	**07**
Q.4	**(a)**	Define Radiosity (J). Also derive the equation for it in terms of blackbody emission, surface emissivity and incident radiation.	**07**
	(b)	A pan of water sits on the ground in the desert at night. The effective temperature of clear night sky is -15^0 C. The surrounding air temperature is -5^0 C. Calculate equilibrium temperature of water if h_C=8.5 W/m^{2}K and h_R=4.25 W/m^{2}K.	**07**

OR

Q.4	**(a)**	Explain the reasons for ability to freeze water in the desert at night when the ambient temperature is much higher than 0^0 C?	**07**

(b) Illustrate the relative temperature relationship for Forced Air Cooling and Radiant Cooling systems with necessary figure. **07**

Q.5 (a) Write short note on following thermal comfort tools used for radiant systems analysis. **07**

(i) Energy Plus (ii) ASHRAE Research Project-781

(b) A room contains five people and 2 numbers of light fixtures of 300 W each. The ventilation system provides 1.2 kg/s of air at 160 C. Heat is transferred from the surroundings to room at a rate of 120 W. Calculate the specific enthalpy of the air in the room. **07**

OR

Q.5 (a) Explain the operation of a bimetallic thermostat for temperature control with necessary figures. **07**

(b) The air flow through a circular duct at 25 m/s at an elevation of 50 m. Calculate the change in total specific energy of the air if its velocity reduced to 3 m/s and brought to an elevation of 12 m. The air is cooled by 200 C. **07**

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