GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1721004   **Date: 05-12-2014**
Subject Name: Radiation Heating and Cooling System
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.**

Q.1	**(a)**	Distinguish between Configuration Factor and Interchange Factor by giving suitable examples.	**07**
	(b)	Explain the operation of a bimetallic thermostat for temperature control with necessary figures.	**07**
Q.2	**(a)**	Explain concept of ‑Relative Temperature Relationshipø for forced air cooling system and radiant cooling system.	**07**
	(b)	Explain with necessary figure Gagge Two-node Model for thermal comfort.	**07**

OR

	(b)	Write short note on following thermal comfort tools used for radiant systems analysis. (i) Energy Plus (ii) ASHRAE Research Project-781	**07**
Q.3	**(a)**	Describe the method to calculate the MRT in terms of radiant intensity balance at a particular point in the room.	**07**
	(b)	Describe methodology for solving the mass conservation and energy conservation equations for a typical HVAC situation.	**07**

OR

Q.3	**(a)**	Explain Plankøs law and Wienøs displacement law applied to radiant energy transfer phenomenon.	**07**
	(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.4	**(a)**	Describe briefly Spherical Harmonics and Monte Carlo methods as solution techniques for solving the Radiative Transfer Equations (RTE).	**07**
	(b)	Describe design considerations for electric radiant heating panels.	**07**

OR

Q.4	**(a)**	Enumerate the different types of temperature controls used for radiant systems. Explain working of any one with figure.	**07**
	(b)	Define concept of energy balance in context to Radiant Cooling. Describe the important characteristics of control volume.	**07**

Q.5 **(a)** Distinguish between Configuration Factor and Interchange Factor by giving suitable examples. **07**

(b) The air flow through a circular duct at 30 m/s at an elevation of 60 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 15 m. The air is cooled by 18^0 C. **07**

OR

Q.5 **(a)** Explain Radiosity (J) and Irradiation (G). Also explain the concept of space and surface resistance with the help of electrical network approach. **07**

(b) Explain following with necessary neat sketch. **07**

    (i) Solid angle   (ii) Blackbody radiation

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