Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst SEMESTER–EXAMINATION – JULY- 2012

Subject code: 1721004 **Date: 12/07/2012**

Subject Name: Radiation Heating and Cooling System

Time: 10:30 am – 13:00 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)**	Define 'Thermal Comfort' as per ASHRAE Standard 55 (1992). Also Explain briefly the Gagge Model of thermal comfort.	**07**
	(b)	Explain the term "Control Volume". Also describe the important characteristics of control volume.	**07**
Q.2	**(a)**	Distinguish between: (i) Black body and grey body (ii) Absorptivity and emissivity of a surface (iii) Total emissive power and monochromatic emissive power.	**07**
	(b)	State and explain any three laws as applied to radiation heat transfer.	**07**
		OR	
	(b)	Explain the concept of Mean Radiant Temperature and Operative temperature.	**07**
Q.3	**(a)**	Define intensity of radiation and prove that the intensity of normal radiation is $1 / \pi$ times the total emissive power.	**07**
	(b)	Establish a relation for the shape factor of a cavity with respect to itself. The cavity is closed on its outer surface with a flat surface. Explain with the help of taking example of cylindrical cavity of depth h and diameter d.	**07**
		OR	
Q.3	**(a)**	A black body of 0.2 m^2 area has an effective temperature of 800K. Calculate (i) Total rate of energy emission (ii) Intensity of normal radiation (iii) Intensity of radiation along a direction 60° to the normal (iv) Wavelength of maximum monochromatic emissive power.	**07**
	(b)	Calculate shape factor for the following. • Diagonal partition within a long square duct. • End and side of circular tube of equal length and diameter.	**07**
Q.4	**(a)**	Briefly explain thermal comfort design methodology.	**07**
	(b)	Write a short note on Rohles-Nevin studies.	**07**
		OR	
Q.4	**(a)**	Write a short note on ventilation with radiant heating and cooling systems.	**07**
	(b)	Compare and contrast radiant heating and cooling with that of convection.	**07**
Q.5	**(a)**	Enlist various flow controls used for radiant heating and cooling systems. Explain briefly any one with a neat sketch.	**07**
	(b)	Write a short note on radiant heating panels.	**07**
		OR	
Q.5	**(a)**	Explain the working of convective systems with radiant panels.	**07**
	(b)	Enumerate some salient features and characteristics of radiation. What position does thermal radiation occupy in the electromagnetic spectrum?	**07**

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