

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. **07**
(i) Radiant Cooling (ii) Mean Radiant Temperature
- (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 20⁰ 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. **07**
(i) Emissivity (ii) Absorptivity (iii) Transmissivity
- (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**
