Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 1721004 **Date:15/05/2015**

Subject Name: Radiation Heating and cooling System

Time: 02:30 pm to 5:00 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) Explain with figure Heat Transfer Modes within an enclosed space fitted with Radiant Cooling System. 07

Q.2 (a) Explain concept of 'Relative Temperature Relationship' 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 brief answers for followings. 07

(i) Give definition of Radiation Intensity (I) with necessary figure.

(ii) Derive $\lambda_{max}T=2.898\times10^{-3}$ mK with the help of Planck's law.

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) 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 16^0 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.3 (a) Explain Plank's law and Wien's displacement law applied to radiant energy transfer phenomenon. 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 20^0 C. 07

Q.4 (a) Describe briefly Spherical Harmonics and Monte Carlo methods as solution techniques for solving the Radiative Transfer Equations (RTE). 07

(b) Explain following terms as characteristics of building materials. 07

(i) Emissivity (ii) Absorptivity (iii) Transmissivity

OR

Q.4 (a) Describe simplified Radiant Transport Function with schematic diagram. 07

(b) Explain following with necessary neat sketch. 07

(i) Solid angle (ii) Blackbody radiation

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

(b) Define concept of energy balance in context to Radiant Cooling. Describe the important characteristics of control volume. 07

OR

Q.5 **(a)** A thin plate receives radiation on one side from a surface at 650^0 C and radiates on the other face to a surface at 150^0 C. Determine the temperature of the plate. Take F=1. Neglect convection heat flow. 07

(b) Write short note on Modified Degree-Day method. 07