

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Examination July 2010

Subject code: 721004**Subject Name: Radiation Heating & Cooling System****Date: 08 /07 /2010****Time: 11.00am – 1.30pm****Instructions:****Total Marks: 60**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of properties tables permitted.

Q.1 (a) Define Radiant Cooling or Heating Panel. Also describe characteristics of Radiant Systems. **06**

(b) List the assumptions made by Fanger to develop the comfort model. Explain the Fanger one-node model with figure. **06**

Q.2 (a) Define concept of energy balance in context to Radiant Cooling. Describe the important characteristics of control volume. **06**

(b) Air at 34°C is moving at a velocity of 28 m/s at an elevation of 50 m. Calculate the change in total specific energy of the air if it is retarded to a velocity of 3 m/s and lowered to an elevation of 12 m with cooling to temperature of 22°C. **06**

OR

(b) A 15 mm outside diameter pipe carries LN₂. Another pipe of 20 mm outside diameter and at 290 K surrounds it coaxially and the space between the pipes is evacuated. Determine the radiant heat flow for 4 m long pipe if surface emissivity for both surfaces is 0.215. Also calculate percentage reduction in heat flow if a shield of 18 mm diameter and 0.05 surface emissivity is placed between the pipes. **06**

Q.3 (a) Briefly explain the improvements to the GAGGE and FANGER thermal comfort models. **06**

(b) Explain the concept of MRT in context to radiant cooling of the room. **06**

OR

Q.3 (a) Explain briefly about recent thermal comfort tools with their significance for evaluating thermal comfort parameters. **06**

(b) Explain the Radiative Resistance Network approach for radiative heat transfer analysis. **06**

Q.4 (a) Describe the important evaluation features of radiant panel. **06**

(b) Explain the radiant panel cooling system design procedure as per Systems Handbook, ASHRAE, 1984. **06**

OR

Q.4 (a) Explain working of hybrid radiant-convective heating and cooling system with figure. **06**

(b) Discuss the benefits of radiant-convective hybrid systems. **06**

Q.5 (a) Describe the Modified Degree-Day method for sizing the cooling system for the typical office space. **06**

(b) Two surfaces of 1 m² area facing to each other have interaction between them only. The surfaces have emissivity and surface temperature of 0.8 at 800 K and 0.9 at 295 K respectively. What is the net radiative heat transfer from surface at high temperature to surface at low temperature? **06**

OR

Q.5 (a) Explain the working of line voltage thermostat control for electrical radiant heating system. **06**

(b) Enumerate the different types of temperature controls used for radiant systems. Explain working of any one with figure. **06**
