Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(AE) (2011 Onwards) (Sem.–5)

HEAT TRANSFER

Subject Code : BTAE-503

Paper ID : [A2063]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a. What is the effect of temperature and pressure on thermal conductivity of gases?

b. Explain the significance of diffusivity.

c. Write the general one dimension heat conduction equation in cylindrical coordinates.

d. Draw the temperature profile curve for heat conducting spherical wall.

e. What do you mean by fin efficiency?

f. Write the equation for critical thickness of insulation for spherical wall.

g. What do you mean by Biot number and Fourier number?

h. Why counter flow heat exchanger is more effective than parallel flow heat exchanger?

i. What are grey bodies?

j. Explain the term fouling factor.

SECTION-B

2. Explain various modes of heat transfer by using suitable examples.

3. Derive the general equation of one dimensional steady state heat conduction for a plane wall.

4. What is the significance of Prandtl number? How is it defined?

5. Discuss various types of heat exchangers with neat sketches.

6. A composite wall is formed of a 2.5 cm copper plate, 3.2 mm layer of asbestos, and a 5 cm layer of fiberglass. The wall is subjected to an overall temperature difference of 560°C. Calculate the heat flow per unit area through the composite wall.

SECTION-C

7. Two rectangles 50 by 50 cm are placed perpendicularly with a common edge. One surface gas T_1 = 1000 K, ε_1 = 0.6, while the other surface is insulated and in radiant balance with a large surrounding room at 300 K. Determine the temperature of the insulated surface and heat lost by the surface at 1000K.

8. Derive the relationship for temperature distribution of a fin of finite length and loosing heat by convection from its end.

9. A man is found dead in a room at 16°C. The surface temperature on his waist is measured to be 23°C and heat transfer coefficient is estimated to be 9 W/m^2°C. Modelling the body as 28 cm diameter, 1.8 m long cylinder, estimate how long it has been since he died. Take the properties of body to be k = 0.62 W/m°C and $\alpha = 0.15 \times 10^{-6}$ m^2/s and assume initial temperature of the body to be 36°C.