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 has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a. Discuss the mechanism of convection.

b. What is the effect of temperature and pressure on thermal conductivity of solid?

c. What is diffusivity?

d. Write the general one dimension heat conduction equation in spherical coordinates.

e. Explain Fourier's law of heat conduction.

f. Explain the term thermal resistance.

g. Draw the temperature profile curve for heat conducting cylindrical wall.

h. What is lumped parameter analysis?

i. Distinguish between fin efficiency and fin effectiveness.

j. Write the equation for critical thickness of insulation for cylindrical wall.

SECTION-B

2. Distinguish between heat transfer and thermodynamics.

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

4. Air at 20°C blows over hot plate of dimension 50 × 75 cm maintained at 250°C. The convection heat transfer coefficient is 25W/m^2. Calculate heat transfer. Assuming that the plate is made of carbon steel(1%) 2cm thick of thermal conductivity 43 W/m°C and the heat lost from the plate surface by radiation is 300 W, calculate the inside plate temperature.

5. What are fins? Explain the various types and their uses.

6. What is scope of heat transfer in IC engines?

SECTION-C

7. Derive the relationship for temperature distribution of a fin insulated at tip.

8. 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. Modeling 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.

9. A counter flow double-pipe heat exchanger is used to heat from 20 °C to 40 °C by cooling oil from 90 °C to 55 °C. The heat exchanger is designed for a total heat transfer of 59 KW with an overall heat transfer coefficient of 340 W/m^{2o}C. Calculate surface area of heat exchanger.