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

Total No. of Questions : 09

B.Tech.(AE) (2012 to 2017) (Sem.–5)

HEAT TRANSFER

Subject Code : BTAE-503

M.Code : 70486

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. Explain the mechanism of heat transfer in fluids.

b. Write the Fourier's equation of conduction in spherical coordinates.

c. Explain the importance of critical thickness of insulation.

d. What do you mean by thermal stresses?

e. Define LMTD and what is its importance?

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

g. What is the effect of temperature and pressure on thermal conductivity of solids?

h. What is characteristic length?

i. Which dimensionless number is more significant in turbulent flow?

j. State Kirchhoff's law?

SECTION-B

2. What is thermal diffusivity? Discuss its significance.

3. Derive and plot the temperature distribution in a plane wall with heat generation.

4. A thick-walled tube of stainless steel [18% Cr, 8% Ni, k = 19 W/m°C] with 2-cm inner diameter (ID) and 4-cm outer diameter (OD) is covered with a 3-cm layer of asbestos insulation [k = 0.2 W/m°C], If the inside wall temperature of the pipe is maintained at 600°C, calculate the heat loss per meter of length. Also calculate the tube -insulation interface temperature.

5. Derive the relationship for the heat transfer from the fin insulated at tip.

6. What are Newtonian and non-Newtonian fluids? Give examples.

SECTION-C

7. The variation in the thermal conductivity of a material is given by $K = K_o (1 + \alpha T + \beta T^2)$, find the expression for the steady state heat transfer in wall of thickness L maintained at surface temperatures T_1 and T_2 ($T_1 > T_2$).

8. Two rectangles 50 by 50 cm are placed perpendicularly with a common edge. One surface has T1 = 1000 K, $\varepsilon_1 = 0.6$, 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 the heat lost by the surface at 1000 K.

9. Discuss the various parameters that affects the IC engine heat transfer.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.