Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech (ME) (Sem.–5)

HEAT TRANSFER

Subject Code : ME-303

Paper ID : [A0815]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS 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) How does heat conduction different from convection?

b) Why extended surface are most commonly used?

c) Define laminar and turbulent flow.

d) Define Kirchhoff's law.

e) Define and explain the term thermal diffusivity?

f) What is the physical significance of Reynolds number?

g) Define fin efficiency and a few examples of use of fins.

h) What is the Stanton number?

i) Why the heat transfer coefficient for natural convection is much less than that for forced convection?

j) Define the shape factor.

SECTION-B

2. A horizontal plate (K = 30 W/m K) 600mm × 900mm × 30mm is maintained at 300°C. The air at 30°C flows over the plate. If the convection coefficient of air over the plate is 22 W/m^{2}K and 250 W heat is lost from the plate by radiation. Calculate the bottom surface temperature of the plate.

3. By using dimensional analysis develop a generic empirical relation between Nusselt number, Reynolds number, Prandtl number for forced convection heat transfer

4. Derive an expression of heat dissipation for an infinitely long fin.

5. Establish the general heat conduction equation in cylindrical co-ordinates.

6. Calculate the heat generated in the body of a man it for comfortable living .The body is to be at 35°C whilst the environmental conditions are at 15°C.The body of the man may be idealized as a cylinder of 30cm diameter and 160 cm height, using the correlation

$$N_u = 0.2(Gr\ \mathrm{Pr})^{\frac{1}{3}}$$

SECTION-C

7. Describe the different boiling regimes in case of pool boiling.

8. A parallel flow heat exchanger has to cool 2500Kg/hr of oil from 70°C to 30°C. Cooling water enters the exchanger at 10°C and leaves at 20°C. Specific heat of oil is 2.1 kJ/Kg K. Determine the effectiveness of heat exchanger and heat transfer capacity.

9. Prove that the density of normal radiation is 1/π times the total emissive power.