B.Tech. (Sem. - 5th)
HEAT TRANSFER
SUBJECT CODE : ME - 303
Paper ID : [A0815]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours   **Maximum Marks : 60**
Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1)   **(10 × 2 = 20)**

a) How does heat transfer differ from thermodynamics?

b) Define thermal resistance.

c) Define thermal diffusivity.

d) What do you understand by fin effectiveness?

e) Define forced convection.

f) What is pool boiling?

g) Define absorptivity.

h) What is radiation density?

i) What is the purpose of coefficient of thermal conductivity?

j) Explain radiation as a mode of heat transfer.

Section - B

Q2) Beginning with a general conduction equation make suitable assumptions to show that temperature distribution through a plane wall is linear.

Q3) What is meant by lumped capacity? What are the physical dimensions necessary for a lumped unsteady state analysis to apply?

Q4) What is utility of extended surfaces? For a constant cross-sectional area fin, obtain the temperature distribution and total heat flow rate under steady state conditions when one end of the fin is attached to a body at high temperature and the other end is insulated.

Q5) Explain the mechanism of heat conduction in metals and insulators.

Q6) Derive relation for heat dissipation from an infinitely long fin. Also write design considerations for fins.

Section - C

Q7) (a) How is Reynolds number defined for film condensation?

(b) Dry saturated steam at atmospheric pressure condenses on the surface of a horizontal tube of 35 mm diameter. What should be the surface temperature of the tube if the rate of heat flow is required to be 6×10^4 W/m²? Also determine the heat transfer coefficient under these conditions.

Q8) (a) What is meant by fouling factor? How does it affect the performance of a heat exchanger?

(b) Show the temperature variation along the length of heat exchanger when
   (i) Hot and cold fluids flow in parallel and counter flow fashion.
   (ii) Hot fluid as used for evaporating another liquid.
   (iii) Steam condenses on the outside of a condenser tube with water flowing inside the tube as a coolant.

Q9) Write short notes on :
   (a) Hydrodynamic and thermal boundary layers.
   (b) Stefan boltzman's Law.
   (c) Fourier's law of heat conduction.

❖❖❖❖