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

Total No. of Questions : 09

B.Tech. (ME) (Sem.–6)

HEAT TRANSFER

Subject Code : BTME-602

M.Code : 71186

Date of Examination : 29-05-2023

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) Define Thermal diffusivity.

b) What is meant by overall heat transfer coefficient? How it is calculated?

c) Define radiation shape factor, what is its use?

d) Why thin fins are preferred over a thick fin?

e) Define the term NTU. What does it interpret?

f) Define monochromatic emissive power.

g) What are the different theories of nucleation?

h) What are the different phases of flow boiling?

i) What is Newtonian heating of solids?

j) Briefly explain the concept of dimensional analysis.

SECTION-B

2. Derive conduction equation in cylindrical coordinate system.

3. Derive the relation of temperature distribution and heat transfer for rectangular fin losing heat at the tip.

4. Prove by dimensional analysis for natural convection that Nusselt no. is a function of Grashoff no. and Prandtle no.

5. The air at 40°C flows with a velocity of 8 m/s along a flat plate 3m long, maintained at 100°C. Calculate local heat transfer coefficient at the end of the plate. Assume critical Reynold no. ($Re_{cr} = 2\times10^5$).

6. State and explain the concept of Lambert's cosine law and intensity of radiation diagrammatically.

SECTION-C

7. A pipe of 4cm diameter is maintained at temperature T_1 and is covered with an insulation of k = 0.3 W/mK to reduce the heat loss. The heat is dissipated from the outer surface of insulation in to an ambience at T_2 with h = 10W/m^2K. Calculate the thickness of insulation at which the heat dissipation rate would be maximum. Also calculate the ratio of heat loss from the outer surface of insulated pipe and that of the bare pipe for :

   a) Thickness of insulation equal to critical thickness

   b) The thickness of insulation is 2 cm thicker than the critical thickness

8. A fluid with C_p = 3.5 kJ/kg °C at 100°C and at the rate of 30×10^3 kg/h enters in to a heat exchanger. For heat exchange water enters the heat exchanger from the same direction at 10°C at a rate of 50×10^3 kg/h. If the heat transfer area is 9 m^2 and U = 990 W/m^2°C. Calculate the outlet temperatures of both the fluids.

9. Derive the models for film wise condensation on a vertical plate.

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC against the Student.