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

Total No. of Questions : 09

B.Tech. (Chemical Engg.) (Sem.–4)

HEAT TRANSFER

Subject Code : BTCH-401B

M.Code : 78131

Date of Examination : 02-07-22

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) What is hydraulic diameter and when is it used?

b) Distinguish between laminar and turbulent flow in physical sense.

c) Define Peclet number and Graetz number.

d) What is the Dittus-Boelter equation? When does it apply?

e) What is Gray body?

f) How is Reynolds number defined for film condensation?

g) What is the effectiveness of heat exchanger?

h) Define the overall heat transfer coefficient.

i) Why are baffles used in shell and tube heat exchangers?

j) Define Stefan Boltzmann law.

SECTION-B

2. The inner and the outer surfaces of the furnace wall, 25cm thick, are at 300°C and 30°C respectively. The thermal conductivity of the wall material varies with temperature and is prescribed as $k = (1.45 + 0.5 \times 10^{-5} t^2) \frac{kJ}{mhr\,\deg}$ where t is in deg C. Calculate the heat loss per square meter of the wall surface area.

3. Distinguish between free and forced convection briefly.

4. What is a heat exchanger and explain briefly different types of heat exchangers?

5. Develop a velocity profile and film heat transfer coefficient for a laminar film condensation on a vertical flat plate. State the assumptions also.

6. Explain what is log mean temperature difference (LMTD) in heat exchangers. Determine the following expression of LMTD in parallel flow heat exchangers with suitable assumptions.

$$\text{LMTD} = \frac{\Delta T_1 - \Delta T_2}{\ln\left(\frac{\Delta T_1}{\Delta T_2}\right)}, \text{ where } \Delta T_1 = T_{h,i} - T_{c,i} \text{ and } \Delta T_2 = T_{h,o} - T_{c,o}$$

SECTION-C

7. What is fin efficiency and effectiveness of fin and how they are different from each other?

8. Define :

   a) Number of transfer units (NTU)

   b) Heat exchanger effectiveness and

   c) Nucleate boiling.

9. Explain the boiling regime associated with progressively increasing heat flux.

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.