

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 : 05-07-22

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) Define heat transfer.
- b) How does heat transfer differs from thermodynamics?
- c) State Newton's law of cooling.
- d) List some good conductors of heat.
- e) What is the utility of extended surface?
- f) What is difference between Laminar flow and Turbulent flow?
- g) Define the Nusselt number.
- h) What is condensation and when does it occurs?
- i) Define absorptivity.
- j) State Kirchoff's law of radiation.

SECTION-B

2. Discuss the different modes by which heat can be transferred. Give 5 suitable examples to illustrate your answer.
3. Explain why marble floor appears colder than cemented floor in winter though both are at the same temperature.
4. An iron ($k = 65 \text{ W/mK}$) billet measuring $20 \times 15 \times 80 \text{ cm}$ is exposed to a convective flow resulting in convection coefficient $h = 11.5 \text{ W/m}^2\text{K}$. Determine the Biot number and the suitability of a lumped analysis to represent the cooling rate if the billet is initially hotter than environment.
5. Define Reynolds number and mention its physical significance.
6. Define black, grey and real surface as applied to radiation heat transfer.

SECTION-C

7. Write the Fourier rate equation for heat transfer by conduction. Give the units and physical significance of each term appearing in this equation. Why there is a negative sign in the Fourier's law of heat conduction?
8. Give a general equation for the rate of heat transfer by convection, and hence define the coefficient of heat transfer. List the various factors on which the value of coefficient depends.
9. Saturated steam at atmospheric pressure condenses on the outer surface of a vertical tube of length 1 m and outer diameter 75 mm. The tube wall is maintained at a uniform surface temperature of 40°C by the flow of cooling water inside the tube. Estimate the steam condensation rate and the heat transfer rate of the tube. What water flow rate will result in a 5°C temperature difference of water between outlet and inlet of pipe? Also, calculate the flow Reynolds number to check the assumption of laminar flow conditions.

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.