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

Total No. of Questions : 09

B.Tech. (Automobile Engineering) (Sem.–4)

HEAT TRANSFER AND COMBUSTION

Subject Code : BTAE-403-18

M.Code : 77529

Date of Examination : 09-07-22

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) Distinguish between heat transfer and thermodynamics.

b) Define thermal diffusivity of a material.

c) What is Convection of Heat? Give an example.

d) Define fins or extended surfaces.

e) Define the terms emissivity and absorption.

f) Explain Kirchhoff's law.

g) Give applications of heat exchangers.

h) Define heat exchanger effectiveness.

i) How fuels are classified. Give one example for each.

j) Define calorific value.

SECTION-B

2. Justify the validity of the following statements :

   a) Thermal conductivity of a pure metal is always higher than that of its alloys.

   b) Thermal conductivity of liquids is generally higher than that of gases and vapours.

3. Explain the types of boundary conditions involved in heat transfer problems.

4. Two large planes are at 1000 K and 600 K. Determine the heat exchange per unit area when (a) if surfaces are black, (b) if the hot one has emissivity of 0.8 and cooler one has 0.5, (c) if a large plate is inserted between these two, having emissivity of 0.2.

5. Air at 20°C flows over a flat plate maintained at 75°C. Measurements show that temperature at a distance of 0.5 mm from the surface of plate is 50°C. Presuming thermal conductivity of air as 0.0266 W/m-deg, estimate the value of local heat transfer coefficient.

6. Write a note on analysis of fuels and flue gases.

SECTION-C

7. The door of a domestic refrigerator has an area of 0.7 m^2 and it basically consists of a thin metal sheet with a 25 mm thick layer of insulation on the inside. The thermal conductivity of this insulation is 0.25 W/m-deg and heat transfer on each side of the door is 10 W/m^2 –deg. Determine the heat flow rate through the door and the temperature of the metal sheet. The refrigerated chamber and the room are at 0°C and 20°C, respectively. Neglect thermal resistance due to the sheet metal.

8. A steam condenser is transferring 250 kW of thermal energy at a condensing temperature of 65°C. The cooling water enters the condenser at 20°C with a flow rate of 7500 kg/hr. Calculate the log mean temperature difference. If overall heat transfer coefficient for the condenser surface is 1250 W/m^2-deg, what surface area is required to handle this load? What error would be introduced if the arithmetic mean temperature difference is used rather than the log-mean temperature difference?

9. Write short notes on:

   a) Concept of Gray-Diffuse Isotropic surface.

   b) Orsat's apparatus.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.