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

Total No. of Questions : 18

B.Tech. (Automobile Engineering) (2018 Batch) (Sem.–4)

HEAT TRANSFER AND COMBUSTION

Subject Code : BTAE-403-18

M.Code : 77529

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

Write briefly :

Q1. What are Opaque Bodies?

Q2. Write the Fourier's equation of conduction in spherical coordinates.

Q3. Explain the importance of critical thickness of insulation.

Q4. What do you mean by black body?

Q5. Define LMTD and what is its importance?

Q6. Why counter flow heat exchanger is more effective than parallel flow?

Q7. What is the effect of temperature and pressure on thermal conductivity of solids?

Q8. What is Characteristic Length?

Q9. What do you mean by high calorific and low calorific value?

Q10. State Kirchhoff's law.

SECTION-B

Q11. What is Thermal Diffusivity? Discuss its significance.

Q12. Drive and plot the temperature distribution in a plane wall with heat generation.

Q13. An aluminium fin 3 mm thick and 7.5 cm long protrudes from a wall. The base is maintained at 300°C, and the ambient temperature is 50°C. Calculate the heat loss from the fin per unit depth of material. Use K = 200 W/m°C, h = 10W/m^2°C.

Q14. A truncated cone 30 cm high is constructed of aluminium. The diameter at the top is 7.5 cm and the diameter at the bottom is 12.5 cm. the lower surface is maintained at 93°C and the upper surface at 540°C. The other surfaces are insulated. Assuming one dimensional heat flow, calculate rate of heat transfer in watts.

Q15. What are Newtonian and non-Newtonian fluids? Give examples.

SECTION-C

Q16. The variation in the thermal conductivity of a material is given by $K=K_0 (1+ \alpha T+ \beta T^2)$, find the expression for the steady state heat transfer in wall of thickness L maintained at surface temperatures T_1 and T_2 ($T_1 > T_2$).

Q17. It is desired to heat 230 Kg/hr. of water from 35 to 93°C with oil (Cp = 2.1 kJ/Kg°C) having an initial temperature of 175°C. The mass flow of oil is also 230 kg/hr. Two double pipe heat exchangers are available; Exchanger 1 with U = 570 W/m^2°C, A = 0.47 m^2; Exchanger 2 with U = 370 W/m^2°C, A = 0.94 m^2, which exchanger should be used?

Q18. With the help of neat sketch discuss the process of analysis of flue gas in 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.