29/12/18 (E)

YMCA UNIVERSITY OF SCIENCE& TECHNOLOGY, FARIDABAD

B. TECH. 6th SEMESTER, Dec. 2018

Heat and Mass Transfer (MU-306)

TIME: 3 hrs **M.MARKS:60**

NOTE: 1 Part I is compulsory
2 Attempt any four questions out of six from Part II

PART –I

Q.1a) Write the significance of Prandtl no. and Nusselt no.
b) What is fin performance and effectiveness.
c) What is difference between pool boiling and flow boiling.
d) Explain the role of baffles in a shell and tube exchanger
e) Write the energy equation for laminar boundary layer on a flat plate.
f) State the Kirchoff's law of radiation.
g) explain hydrodynamic and thermal boundary layer.
h) Explain critical thickness of insulator.
i) State different modes of mass transfer.
j) describe the relation between fluid friction and heat transfer.
(10x2)

PART -II

Q.2 Derive the expression for boundary layer equation for flat plate (forced convection) by von karman solution. **10**

Q.3 Derive a 3D general conduction equation in Cartesian coordinates for a homogeneous material. **10**

Q.4 A current of 200A is passed through a stainless steel wire(k=19W/m°C) 3 mm in diameter. The resistivity of the steel may be taken as 70μΩ cm and length of the wire is 1m. The wire is submerged in a liquid ai 110°C and experience a convection heat transfer coefficient of 4kW/m^2°C. Calculate the central temperature of wire. **10**

Q. 5 A 1kW heater is conducted a glass with an electically conducting film which produces a constant heat flux. The plate is 60x60 cm and placed in an air stream at 27°C, 1 atm with u_∞=5m//s. Calculate the average temperature difference at the trailing edge. **10**

Q.6 Water at the rate of 3.8kg/s is heated from 38 to 55°C in a shell and tube heat exchanger. On the shell side one pass is used with water as the heating flui, 1.9kg/s entering the exchanger at 93°C. The overall heat transfer coefficient is 1419W/ m^2°C, and average water velocity in the 1.9 cm diameter tubes is 0.366m/s. Tube length must not be longer than 2.5m. Calculate the no. of tube passes, the no. of tubes per pass and length of the tube. **10**

Q.7 Explain in details different modes of mass transfer. State and drive the Fick's law of diffusion. **10**

(4x10)