

CM-702(A) (GS)
B.E. VII Semester Examination, June 2020
Grading System (GS)
Transport Phenomenon
Time : Three Hours

Maximum Marks : 70

- Note:** i) Attempt any five questions.
ii) All questions carry equal marks.

1. What is the diffusivity for a dilute solution of acetic acid in water at 12.5°C. The density of acetic acid at its normal boiling point is 0.937 g/cm³. The viscosity of water at 12.5°C is 1.22cP. Using the Wilke-Chang equation.
2. a) Explain Time-smoothed Equations of Change for Incompressible Fluids and the time-smoothed velocity distribution in the neighborhood of a wall.
b) Explain Eddy-Viscosity Hypothesis. Why Eddy viscosity models are widely used and popular.
3. Droplet of substance A is suspended in a stream of gas B. The droplet radius is r_1 . Assuming that there is a spherical stagnant gas film of outer radius r_2 surrounding the droplet. Obtain an expression by shell balance method for the flux of component A in the gas phase when its concentrations are X_{A1} and X_{A2} at radii r_1 and r_2 respectively. Also show that when r_2 tends to infinity, the Sherwood number is 2.
4. Explain the following theories.
 - i) Boussinesq's eddy viscosity
 - ii) Prandtl's mixing length
 - iii) Von Karman's similarity hypothesis
5. a) What are Analogies in different transport processes?
b) What are the differences between heat transfer and mass transfer?
6. Compare the velocity distribution and average velocity for the steady, fully developed laminar and turbulent flow in a circular tube of radius R.
7. Estimate the thermal conductivity of liquid carbon tetrachloride (CCl₄) at 20°C and atmospheric pressure

$$\rho = 15.95 \text{ kg/m}^3 \frac{1}{\rho} \left(\frac{\partial \rho}{\partial p} \right)_T = 89.5 \times 10^{-11} \text{ m}^2 / \text{N}.$$

8. What is the "Reynolds analogy", and what is its significance?
