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S.E. (Chemical) (First Sem.) EXAMINATION, 2019

FLUID MECHANICS

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Neat diagram must be drawn wherever necessary.

(ii) Figures to the right indicate full marks.

(iii) Assume suitable data, if necessary.

(iv) Use of calculator is allowed.

1. (a) Five liters of oil weight 61.80 N. Calculate specific weight, specific mass, specific volume and relative density. [6]
- (b) Classify the various type of manometers. Explain any *one* in detail.

Or

2. (a) Define the following and give their SI units. [6]
- (i) Vapor pressure
- (ii) Specific gravity
- (iii) Kinematic viscosity.
- (b) Draw shear stress - shear rate diagram and explain rheological behaviour of different fluids. [6]

P.T.O.

3. (a) Derive the expression for continuity equation in 3-D flow. [7]
(b) A laminar flow take place this occurs. Also calculate the velocity at 4 cm from wall of the pipe. [6]

Or

4. (a) Draw a neat sketch and explain the working principle of orifice meter. Derive equation. [7]
(b) A horizontal venturimeter with inlet and throat diameter 30 cm and 15 cm respectively is used to measure the flow rate of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Determine the rate of flow. Take $C_d = 0.98$. [6]

5. (a) With suitable example, describe in detail the Reyleigh's Method of Dimensional analysis. [7]
(b) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and $u = U$ at $Y = \delta$, where δ = Boundary layer thickness. Also calculate the value of δ^*/θ . [6]

Or

6. (a) Explain the term dimensional homogeneous equation with suitable example. [7]
(b) Explain Boundary layer growth over a flat plate. [6]

7. (a) Explain Buckingham's π -theorem in detail. [6]
- (b) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by : [7]

$$\frac{u}{v} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2.$$

Or

8. (a) Define and explain boundary layer and its property. [6]
- (i) Laminar boundary layer.
- (ii) Turbulent boundary layer.
- (iii) Laminar sub-layer.
- (b) Define displacement thickness. Derive an expression for the displacement thickness. [7]