Total No. of Questions—8] [Total No. of Printed Pages—3

Seat No.	

[5352]-115

S.E. (Mechanical/Automobile) (I Sem.) EXAMINATION, 2018
FLUID MECHANICS
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer *four* questions out of **8**.
(*ii*) Attempt Q. Nos. **1** *or* **2,** Q. Nos. **3** *or* **4,** Q. Nos. **5** *or* **6** and Q. Nos. **7** *or* **8**.
(*iii*) *All* questions should solve in one answer-book and attach extra supplements if required.
(*iv*) Draw diagrams wherever necessary.
(*v*) Use of scientific calculator is allowed.
(*vi*) Assume suitable data wherever necessary.

Q.1 (a) Derive an expression for total pressure and center of pressure for inclined plane submerged in liquid and hence derive expression for center of pressure for vertical plane. [6]

(b) The velocity distribution for flow over a flat plate is given by $u = [3/4]y - y^2$ in which u is the velocity in m/sec at a distance y meter above the plate. Determine the shear stress at y = 0.15m. Take dynamic viscosity of fluid is 8.6 poise. [6]

OR

Q.2 (a) State and explain Newton's law of viscosity. Explain the importance of viscosity in fluid motion. [6]

(b) Explain Velocity potential, Stream function, Vorticity. [6]

P.T.O.

Q.3 (a) Define HGL and TEL. Draw a neat diagram of Venturimeter and show HGL and TEL for it. [6]

(b) Determine the (i) Pressure gradiant (ii) the shear stress at the two horizontal parallel plates and (iii) the discharge per meter, for the laminar flow of oil with a maximum velocity of 2 m/sec between two parallel fixed plates which are 100mm apart. Given μ =2.4525 Ns/m^2. [6]

OR

Q.4 (a) A horizontal venturimeter with inlet diameter 20cm and throat diameter 10 cm is to measure flow of water. The pressure at inlet is 17.658 N/cm^2 and the vaccum pressure at throat is 30cm of mercury. Find the discharge of water through venturimeter. Take Cd =0.98 [6]

(b) Derive expression for velocity distribution for flow in fixed parallel plates. [6]

Q.5 (a) Derive Darcy- Weisbach equation to calculate loss of head due to friction in pipe. [6]

(b) The frictional torque T of a disc diameter D rotating at a speed N in fluid of viscosity μ and density ρ in a turbulent flow is given by

$$T = D^5 N^2 \rho \phi \{[\mu] / [D^2 N \rho]\}$$

Prove this relations using Buckingham's π-theorem. [7]

OR

Q.6 (a) Explain Reynolds number, Weber number, Euler number. [6]

(b) Explain minor energy losses with suitable figures. [7]

Q.7 (a) A thin plate is moving in still atmospheric air at velocity of 5 m/sec. The length of the plate is 0.6 m and width is 0.5 m. Calculate the drag force at one side of plate, if density of air is 1.24 kg/m^3 and kinematic viscosity 0.15 strokes. [6]

(b) Derive an expression for displacement, momentum and energy thickness. [7]

OR

Q.8 (a) Discuss the boundary layer formation over a flat plate. [6]

(b) A flat plate 1.5m × 1.5m moves at 50 km/hour in stationary air of density 1.15 kg/m^3. If the co-efficients of drag and lift are 0.15 and 0.75 respectively determine The lift force, The drag force, The resistance force and Power required to keep the plate in motion. [7]