Total No. of Questions—8] [Total No. of Printed Pages—4

Seat No.	

[5352]-106

S.E. (Civil) (Second Semester) EXAMINATION, 2018

FLUID MECHANICS—I

(2012 PATTERN)

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

N.B. :— (*i*) Solve Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6**, Q. **7** *or* Q. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data if necessary.

1. (*a*) State and prove Newton's law of viscosity. Classify the fluids giving example of each type. [6]

(*b*) The space between 2 square plates is fluids with oil. Each side of plate is 60 cm. The thickness of oil film is 12.5 mm. The upper plate moves with 2.5 m/s and requires a force of 98.1 N to maintain speed. Determine : [6]

(*i*) Dynamic viscosity of oil in poise and

(*ii*) Kinematic viscosity of oil in stokes.

Take sp. gr. of oil = 0.95.

P.T.O.

Or

2. (*a*) What are the different methods of dimensional analysis ? Explain Buckingham-II theorem method of Dimensional Analysis. [7]

(*b*) What do you understand by similitude ? What are the different types of similitude ? Explain Mach No. and its significance. [5]

3. (*a*) Differentiate between : [4]

(*i*) Absolute and gauge pressure

(*ii*) Simple and differential manometer.

(*b*) Define total pressure and centre of pressure. Derive the expression for total and centre of pressure on a plane surface held below free surface of fluid. [8]

Or

4. (*a*) What is continuity equation and derive the expression for continuity equation. [6]

(*b*) Given V = $x^2yi + y^2zj - (2 \times yz + yz^2)$ K. Prove that it is a case of steady incompressible flow and calculate the velocity and acceleration at (2, 1, 3). [6]

5. (*a*) Derive the equation for discharge through an horizontal venturimeter. What would be the change in discharge for the same flow condition if the venturimeter is held either vertical or inclined. Give reasons. [7]

(*b*) A 20 cm × 10 cm horizontal venturimeter is used to measure flow of oil having specific gravity 0.90. The discharge flowing through venturimeter is 70 LPS, find the reading of the mercury in the manometer. Assume C_d = 0.98. [6]

Or

6. (*a*) What are the characteristics of Laminar flow. Explain Reynold experiment with necessary sketch classifying the flow regime. [4]

(*b*) An oil of viscosity 2.0 poise flow through a circular pipe of diameter 15 mm, held vertical. The pressure measured at 2 points 15 m apart had a value of 150 kPa at upper point and 450 kPa at lower level. Find the direction of flow if the sp. gr. of oil is 0.9. [5]

(*c*) Show that the drag force on a sphere placed in the flow of a highly viscous fluid at low velocity is given by $F_D = 3\pi\ \mu vd$. [4]

7. (*a*) Explain : [6]

(*i*) Degree or level of turbulence

(*ii*) Intensity of turbulence

(*iii*) Wall and free turbulence.

(*b*) List out the semi-empirical theory and formula to find the shear stress in turbulent flow. [4]

(*c*) Explain briefly hydrodynamically smooth and rough boundaries. [3]

Or

8. (*a*) What are the different types of minor losses that occur due to local disturbances in flow through pipe. Derive the Borda-Carnot equation for loss due to sudden expansion. [7]

(*b*) Explain pipe in series and pipe in parallel. Sketch the hydraulic gradient and total energy line for a compound pipe having the following details :

Pipe of 5 cm diameter connected to pipe of diameter 7.5 cm which is further connected to pipe of 5 cm diameter. The pipes are connected in series also indicate the various losses that occur. [6]