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

Seat No.	

[5057]-214

S.E. (Mechanical/Automobile Engg.) (First Semester) EXAMINATION, 2016

FLUID MECHANICS

(2012 PATTERN)

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

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

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

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

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Distinguish between : [6]

(*i*) Simple manometer and differential manometer

(*ii*) Real fluids and ideal fluids

(*iii*) Specific weight and specific volume.

(*b*) Determine the total pressure and centre of pressure on an isosceles triangular plate of base 6 m when it is immersed vertically in an oil of sp. gr 0-8. Take altitude as 4 m and base of the plate coincides with the tree surface of oil. [6]

P.T.O.

Or

2. (*a*) State and prove Pascal's law. [6]

(*b*) The stream function for a two dimensional flow is given by $\psi = 8xy$. Calculate the velocity at the point P(4, 5). Find also velocity potential function ϕ. [6]

3. (*a*) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's theorem from first principle and state assumptions made for such a derivation. [6]

(*b*) Find the discharge of water flowing through a pipe 30 cm diameter placed in an inclined position where a verturimeter is inserted, having a throat diameter 18 cm. The difference of pressure between the main and throat is measured by a liquid of sp gr. 0.7 in an inverted V-tube which gives a reading of 30 cm. The loss of head between the main and throat is 0.2 times the kinetic head of pipe. [6]

Or

4. (*a*) State the operating principle of pitot tube and derive the equation for measurement of velocity at any point for it. [6]

(*b*) The water is flowing through a taper pipe of length 80 m having diameters 600 mm at the upper end and 400 mm at the lower end at the rate of 50 litres/second. The pipe has a slope of 1 in 30. Find the pressure at lower end if the pressure at the higher level is 20.72 N/cm^2. [6]

5. (*a*) A pipe line of length 2000 m is used for power transmission. If 110.3625 KW power is to be transmitted through the pipe in which water having a pressure of 490.5 N/cm^2 at inlet is flowing. Find the diameter of the pipe and efficiency of transmission if the pressure drop over the length of pipe is 98.1 N/cm^2. Take $f = 0.0065$. [7]

(*b*) Define and explain the terms : [6]

(*i*) Hydraulic gradient line

(*ii*) Total energy line.

Or

6. (*a*) Using Buckingham's π theorem, show that the velocity through a circular orifice is given by :

$$V = \sqrt{29H}\ \phi\left[\frac{D}{H}, \frac{\mu}{\rho VH}\right]$$

where H is head causing flow, D is diameter of orice, μ is coefficient of viscosity, ρ is mass density and g is gravitational acceleration. [7]

(*b*) An old water supply distribution pipe of 250 mm diameter of a city is to be replaced by two parallel pipes of smaller equal diameter having equal lengths and identical friction factor values. Find out new diameter required. [6]

7. (*a*) Find the difference in drag force exerted on a flat plate of size 2 m × 2 m when the plate is moving at a speed of 4 m/s normal to its plane in : [7]

(*i*) water

(*ii*) air of density 1.24 kg/m^3

coefficient of drag is given as 1.15.

(*b*) Define the terms : [6]

(*i*) Lift

(*ii*) Drag

(*iii*) Angle of attack

(*iv*) Camber.

Or

8. (*a*) Define displacement thickness and momentum thickness. Derive an expression for displacement thickness. [6]

(*b*) Find the displacement thickness, the momentum thinkness and energy thinkness for the velocity distribution in the boundary layer given by : [7]

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