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

Seat No.	

[4757]-1014

S.E. (Mechanical/Automobile)

(First Semester) EXAMINATION, 2015

FLUID MECHANICS

(2012 PATTERN)

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

N.B. :— (*i*) Answer *four* questions out of **8**.

(*ii*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8.**

(*iii*) *All* the four questions should be solved 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.

1. (*a*) State and prove Hydrostatic Law. [6]

(*b*) Discuss various types of flows. [6]

Or

2. (*a*) A body with gravity force of 500 N with a flat surface area of 0.2 m^2 slides down a lubricated inclined plane making a 30° angle with the horizontal. For viscosity of 0.1 kg.m/s and body speed of 1 m/s. Determine the lubricant film thickness. [6]

(*b*) Prove that streamlines and equipotential lines are orthogonal to each other. [6]

P.T.O.

3. (*a*) Derive an expression for Euler's equation along stream-line. [6]

(*b*) Write short notes on : [6]

(*i*) Hydrodynamically smooth and rough boundaries.

(*ii*) Velocity profile of Turbulent flow.

Or

4. (*a*) What is Pitot tube ? Derive expression for velocity. Draw with all labels Pitot static tube. [6]

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

5. (*a*) Derive an expression for Darcy-Weisbach equation. [6]

(*b*) Discharge Q of a centrifugal pump can be assumed to be dependent on density of liquid ρ, viscosity of liquid μ, pressure p, impeller diameter D, and speed N in RPM. Using Backingham π-theorem, show that : [7]

$$Q = ND^3\phi\left[\frac{gH}{N^2D^2}, \frac{v}{ND^2}\right].$$

Or

6. (*a*) What are repeating variables ? What points are important while selecting repeating variables ? [6]

(*b*) A siphon of dia. 200 mm connects two reservoirs having a a difference of elevation of 20 m. The total length of siphon is 800 m and the summit is 5 m above the water level in the upper reservoir. If separation takes place at 30 kPa (absolute). Find maximum length of siphon from upper reservoir to summit. Take friction factor = 0.016, P atm. = 10.3 m of water. [7]

7. (*a*) Derive an expression for displacement, momentum and energy thicknesses. [9]

(*b*) A car of frontal area 1.4 m^2 travels in still air with speed 72 kmph. If drag coefficient is 0.350, calculate power required to drive the car at this speed. Density of air is 1.2 kg/m^3. [4]

Or

8. (*a*) Discuss boundary layer development over flat plate. [7]

(*b*) Write a short note on "Flow around cylinder and aerofoil". [6]