

Nov-Dec-2012



[4262] – 113A

Seat No.	
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S.E. (Mechanical/Mech. S/W) Examination, 2012  
FLUID MECHANICS  
(2008 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions:** 1) Answers to the **two** Sections should be written in **separate** books.  
2) Neat diagrams must be drawn **wherever** necessary.  
3) Black Figures to the **right** indicate **full** marks.  
4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.  
5) Assume suitable data, if **necessary**.

SECTION – I

Unit – I

1. a) Explain how viscosity of liquids decreases while that of gases increases with size in temperature. 4
- b) A circular disc of diameter 'd' is slowly rotated in a liquid of large viscosity ' $\mu$ ' at a small distance 'h' from a fixed surface. Derive an expression for torque 'T' necessary to maintain an angular velocity of ' $\omega$ ' in the form

$$T = \frac{\pi \mu \omega d^4}{32h} \quad \text{8}$$

- c) Explain the following terms : 6
- i) Surface tension    ii) Compressibility.

OR

2. a) Determine the stream function if the velocity components of a two dimensional incompressible fluid flow are given as

$$u = \frac{y^3}{3} + 2x - x^2y$$

$$v = xy^2 - 2y - \frac{x^3}{3} \quad \text{8}$$

- b) Enlist the various types of fluid flow and explain laminar flow and turbulent flow. 6
- c) What is path lines, streak lines ? 4

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### Unit – II

3. a) Define metacentre and metacentric height. How they are important in case of floating body ? 4
- b) A wooden block of relative density 0.7 has width 15 cm, depth 30 cm and length 150 cm. It floats horizontally on the surface of sea water (density =  $1000 \text{ kg/m}^3$ ) calculate the volume of water displaced, depth of immersion and the position of centre of buoyancy. Also find the metacentric height. 8
- c) Write a short note on stability of submerged bodies. 4
- OR
4. a) State and explain Pascal's law. 4
- b) A square plate  $6 \text{ m} \times 6 \text{ m}$  is placed in a liquid of specific gravity 0.8 at an angle of  $30^\circ$  with free surface. A square hole  $1.5 \text{ m} \times 1.5 \text{ m}$  is set exactly in the centre of the plate. Its greatest and the least depths below liquid surface are 4 m and 2 m respectively. Determine the total pressure on one of the plate and position of centre of pressure. 10
- c) Define centre of pressure and total pressure. 2

### Unit – III

5. a) What are the different forms of energy in a flowing fluid ? Represent schematically the Bernoulli's equation for flow through a tapering pipe and show the position of total energy line and datum line. 8
- b) Derive an equation for measurement of velocity in open channel by pitot tube. 4
- c) Compare venturimeter and orifice meter also write an equation to calculate the discharge through it. 4
- OR
6. a) Derive an equation for discharge areas a triangular notch. 6
- b) The inlet and throat diameters of a vertically mounted venturimeter are 30 cm and 10 cm respectively. The throat section is below the inlet section at a distance of 10 cm. The specific gravity of the liquid is  $900 \text{ kg/m}^3$ . The intensity of pressure at inlet is 140 KPa and the throat pressure is 80 KPa. Calculate the flow rate in l.p.s. Assume that 2% of the differential head is lost between inlet and throat and coefficient of discharge 0.97. 10

