NOV-Dec-2012

[4262] – 113A

Seat No.	

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 white 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 'μ' at a small distance 'h' from a fixed surface. Derive an expression for torque 'T' necessary to maintain an angular velocity of 'ω' in the form

   $$T = \frac{\pi\mu\omega d^4}{32h}.$$ **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

   $$u = y^3/3 + 2x - x^2y$$

   $$v = xy^2 - 2y - x^3/3$$ **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**

P.T.O.

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 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 m × 6 m is placed in a liquid of specific gravity 0.8 at an angle of 30° with free surface. A square hole 1.5 m × 1.5 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 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