Code :9A01304

R9

II B.Tech I Semester(R09) Supplementary Examinations, May 2011
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) A square plate of size 1m X 1m and weighing 350N slides down an inclined plane with a uniform velocity of 1.5 m/s. The inclined plane is laid on a slope of 5 vertical to 12 horizontal and has an oil film of 1mm thickness. Calculate the dynamic viscosity of oil.
   (b) Explain Pascal's law.
2. (a) A wooden cylinder of diameter d and length 2d floats in water with its axis vertical. Is the equilibrium stable? Locate the metacentre with reference to water surface. Specific gravity of wood is 0.6.
   (b) Explain meta center.
3. (a) The following cases represents the two velocity components, determine the third component of velocity such that they satisfy the continuity equation.
      i. $u = x^2 + y^2 + z^2; v = xy^2 - yz^2 + xy$
      ii. $v = 2y^2, w = 2xyz$
   (b) Define stream line & path line.
4. (a) What is momentum equation? Also give its applications.
   (b) A nozzle of diameter 20mm is fitted to a pipe of diameter 40mm. Find the force exerted by the nozzle through the pipe at the rate of $1.2m^3$/minute.
5. For the velocity profile for laminar boundary flow $\frac{u}{U} = \sin\left(\frac{\Pi}{2}\frac{Y}{\delta}\right)$. Obtain an expression for boundary layer thickness shear stress, drag force on one side of the plate and co-efficient of drag in terms of Reynold number.
6. Two parallel plates kept 75mm apart have laminar flow of glycerine between them with a maximum velocity of 1m/s. Calculate the discharge per metre width, the shear stress at the plates, the difference in pressure gradients at the plates and velocity at 15mm from the plate. Take viscosity of glycerine as 8.35 poise.
7. Two pipes each 300m long are available for connecting to a reservior from which a flow of $0.085m^3/s$ is required. If the diameters of the two pipes are 0.3m and 0.15m respectively determine the ratio of the head lost when the pipes are connected in series to the head lost when they are connected in parallel. Neglect minor losses.
8. A reservoir discharge through a sluice 0.915m wide by1.22m deep. The top of the opening is 0.61m below the water level in the reservoir and the downstream water level is below the bottom of the opening. Calculate the discharge through the opening if $C_d = 0.6$ and percentage error if the opening is treated as a small orifice.

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