

Code: CE3T6

**II B.Tech - I Semester – Regular Examinations - January 2014**

**FLUID MECHANICS  
(CIVIL ENGINEERING)**

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Define Newton's Law of Viscosity? Derive an expression for dynamic viscosity with neat sketch. 9 M
- b) Convert a pressure head of 100 m of water to kerosene of specific gravity 0.81 and carbon tetrachloride of specific gravity 1.6 5 M
2. a) Derive an expression for the depth of centre of pressure from free surface for an vertical plane surface submerged in the liquid. 7 M
- b) A Circular plate 2.5m diameter is immersed in water with its greatest and least depth below the free surface being 3m and 1m respectively. Find the total pressure on one face and depth of centre of pressure. 7 M
3. a) Derive an equation for continuity equation in 3-Dimensional flow with Cartesian coordinates. 8 M

- b) Distinguish between Steady & Unsteady flows, Uniform & Non-uniform flows and Rotational and Irrotational flows. 6 M
4. Water flows through a 0.9m diameter pipe at the end of which there is a reducer connecting to a 0.6m diameter pipe. If the gage pressure at the entrance to the reducer is  $412.02 \text{ kN/m}^2$  [ $4.2\text{kg(f)}/\text{cm}^2$ ] and the velocity is 2m/s, determine the resultant thrust on the reducer, assuming that the frictional loss of head in the reducer is 1.5m. 14 M
5. Explain the boundary layer phenomenon along a long thin flat plate and its characteristics with neat sketch. 14 M
6. Explain the laminar flow behavior between two parallel plates when one plate is at rest and the other plate is moving. 14 M
7. a) Derive the Darcy-Weisbach equation for friction loss in pipe. 8 M
- b) A compound piping system consists of three pipes of length 1800m, 1200, & 600m and the respective diameters of the pipe are 0.5m, 0.4m and 0.3. New cast iron pipes connected in series. Convert the system to a equivalent size of pipe length 3600m. 6 M

8. a) Explain the Bernoulli's equation application for a  
Venture meter with neat sketch. 8 M
- b) A tank 1.5m high stands on a trolley and is full of water. It  
has an orifice of diameter 0.1m at 0.3m from the bottom of  
the tank. If the orifice is suddenly opened, what will be the  
force on the trolley? Coefficient of discharge of the orifice  
is 0.6. 6 M