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BIME-004

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B.Tech. Mechanical Engineering / B.Tech Civil Engineering (BTMEVI/BTCLEVI)

Term-End Examination

June, 2014

BIME-004 : FLUID MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note: *Attempt **any five** questions. **All** questions carry **equal** marks. Use of non programmable scientific calculator is allowed.*

1. (a) Derive an expression for capillary rise or fall when a small diameter tube dipped into a liquid. 7

   (b) Explain the different kinds of fluids using neat sketch of Rheogram with one example each. 7

2. (a) Differentiate between Eulerian and Lagrangian approach in detail. 7

   (b) Derive the continuity equation in cartesian co-ordinates. 7

3. (a) Define centre of Buoyancy and Metacentre with figure in detail. 7

   (b) A square lamina of 1 m side is kept in the water being diagonal vertical and its vertex is 1 m below the free water surface. Find the total pressure force and the position of centre of pressure. 7

4. (a) Distinguish between Notches and Weirs in detail with neat sketchs. 7

(b) Explain the method for the determination of coefficient of velocity and coefficient of discharge experimently. 7

5. Using Buckingham's π-theorem, show that the velocity through a circular orifice is given by : 14

$$V = \sqrt{2gH}\ f\,u\left[\frac{D}{H}, \frac{\rho VH}{\mu}\right]$$

Where, H = Head causing flow

D = Diameter of the orifice

μ = Coefficient of viscosity

ρ = Mass density

g = Acceleration due to gravity

6. (a) For a viscous flow through a circular pipe prove that the kinetic energy correction factor is equal to 2. 7

(b) An oil of specific gravity 0.9 and viscosity 10 poise is flowing through a pipe of diameter 110 mm. The velocity at the centre is 2 m/s. Find the pressure gradient in the direction of flow and shear at the pipe wall. 7

7. (a) Discuss the effect of pressure gradient on boundary layer thickness with diagram. 7

(b) A passanger ship of 300 m length and 12 m draft is travelling at 45 km/hr. Determine the total friction drag. 7

8. Answer the followings : **3.5x4=14**

(a) Describe the use and limitations of the flow nets.

(b) Derive Bernoulli's equation from Euler equation of motion.

(c) What is syphone ? Where it is used ?

(d) Explain the differences between minor loss and major loss.