

**B.Tech. – VIEP – Mechanical Engineering /  
B.Tech. Civil Engineering (BTMEVI/BTCLEVI)**

**Term-End Examination**

**December, 2018**

00263

**BIME-004 : FLUID MECHANICS**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume suitable missing data, if any.

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1. (a) How is the U-tube manometer used for measurement of fluid pressure ? Explain with a neat sketch. 7
- (b) A hydraulic press has a ram of 30 cm diameter and a plunger of 4 cm diameter. It is used for lifting a weight of 20 kN. Find the force required at the plunger. 7
2. (a) Obtain the expression for continuity equation for a three-dimensional flow for incompressible fluid. 7
- (b) Explain briefly the working principle of the Bourdon tube pressure gauge with a neat sketch. 7

3. (a) How will you determine the metacentric height of a floating body experimentally ? Explain with a neat sketch. 7
- (b) A circular opening, 3 m diameter in a vertical side of a tank is closed by a disc of 3 m diameter which can rotate about a horizontal diameter. Calculate
- (i) the force on the disc, and
- (ii) the torque required to maintain the disc in equilibrium in the vertical position when the head of water above the horizontal diameter is 6 m. 7
4. (a) Distinguish between rotational flow and irrotational flow. Give an example of each. 7
- (b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of a differential manometer connected to inlet and throat is 10 cm of mercury. Determine the rate of flow. Take  $C_d = 0.98$ . 7

5. (a) What do you understand by the terms fully submerged orifice and partially submerged orifice ? Explain briefly. 7
- (b) Briefly explain the construction and working of an ultrasonic flow meter with a neat sketch. 7
6. (a) What is a pitot tube ? How will you determine the velocity at any point using pitot tube ? 7
- (b) A horizontal pipe of diameter 40 cm is suddenly contracted to a diameter of 20 cm. The pressure intensities in the larger and the smaller pipe are given as  $14.715 \text{ N/cm}^2$  and  $12.753 \text{ N/cm}^2$  respectively. If  $C_c = 0.62$ , find the loss of head due to contraction. Also determine the rate of flow of water. 7
7. (a) Explain the term coefficient of friction. On what factors does this coefficient depend ? 7
- (b) A smooth pipe of diameter 300 mm and length 600 m carries water at the rate of  $0.04 \text{ m}^3/\text{s}$ . Determine the head loss due to friction, wall shear stress, center-line velocity and thickness of laminar sub-layer. Take the kinematic viscosity of water as  $0.018 \text{ stokes}$ . 7

8. Write short notes on any **four** of the following :  $4 \times 3 \frac{1}{2} = 14$

- (a) Turbulent Flow
  - (b) Spillways and Weirs
  - (c) Coefficient of Drag and Lift
  - (d) Couette Flow
  - (e) Dimensional Analysis
  - (f) Electromagnetic Flow Meter
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