

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

Term-End Examination

00743

June, 2018

BIME-004 : FLUID MECHANICS

Time : 3 hours

Maximum Marks : 70

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

1. (a) What do you mean by single column manometers ? How are they used for the measurement of pressure ? 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) Explain briefly the working principle of the Bourdon tube pressure gauge with a neat sketch. 7
- (b) How will you determine the metacentric height of a floating body experimentally ? Explain with a neat sketch. 7

3. (a) With neat sketches, explain the conditions of equilibrium for floating and submerged body. 7
- (b) A body has the cylindrical upper portion of 4 m diameter and 2 m deep. The lowest portion is a curved one, which displaces a volume of 0.9 m^3 water. The centre of buoyancy of the curved portion is at a distance of 2.10 m below the top of the cylinder. The total displacement of water is 4.5 tonnes. Find the metacentric height of the body. 7
4. (a) Define the equation of continuity. Obtain an equation for a three-dimensional flow. 7
- (b) A 40 cm diameter pipe, conveying water, branches into two pipes of diameters 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/s, find the discharge in this pipe. Also determine the velocity in the 20 cm diameter pipe if the average velocity in the 30 cm diameter pipe is 2 m/s. 7
5. (a) What do you understand by the terms fully submerged orifice and partially submerged orifice? Briefly explain. 7
- (b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is 14.715 N/cm^2 and vacuum pressure at the throat is 40 cm of mercury. Find the discharge of water through the venturimeter. 7

6. (a) State Buckingham's π -theorem. What do you mean by repeating variables? How are the repeating variables selected in dimensional analysis? 7
- (b) Briefly explain the construction and working of an ultrasonic flow meter with a neat sketch. 7
7. (a) Explain the term co-efficient of friction. On what factors does this co-efficient 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 stokes. 7
8. Write short notes on any **four** of the following: $4 \times 3 \frac{1}{2} = 14$
- (a) Buoyant Force
- (b) Path Lines and Streak Lines
- (c) Separation of Flow
- (d) Ultrasonic Flow Meter
- (e) Spillways and Weirs
- (f) Couette Flow
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