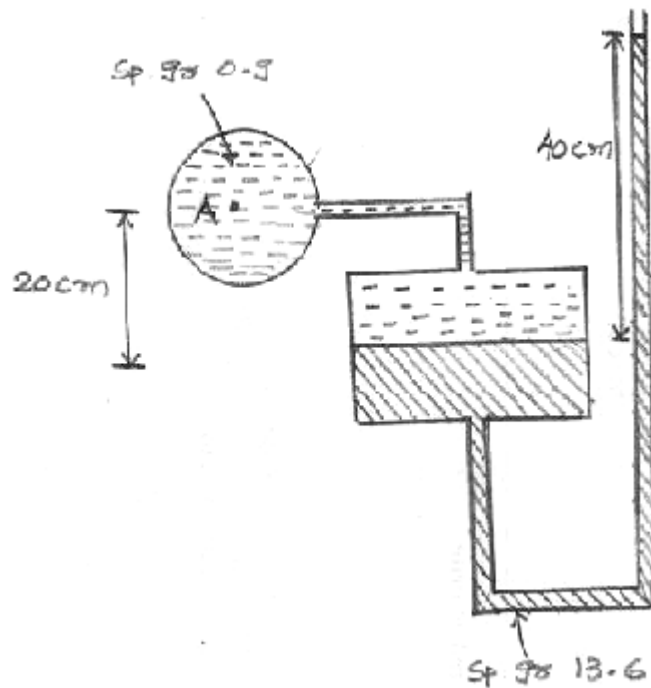


GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III • EXAMINATION – WINTER • 2014

Subject Code: 2130101**Date: 30-12-2014****Subject Name: Fundamentals of Fluid Mechanics****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** 1. A fluid is said to be Newtonian if **07**
 (a) is highly viscous (b) is incompressible and non-viscous (c) obeys Newton's law of viscosity (d) is compressible and non-viscous
2. Absolute pressure is equal to
 (a) $p_{\text{gauge}} - p_{\text{atm}}$ (b) $p_{\text{atm}} - p_{\text{gauge}}$ (c) $p_{\text{gauge}} + p_{\text{atm}}$ (d) $p_{\text{gauge}} - p_{\text{vacuum}}$
3. The centre of gravity of the volume of liquid displaced by a floating body is called _____
 (a) metacentre (b) centre of buoyancy (c) centre of pressure (d) none of the above
4. For pipes, laminar flow occurs when Reynold's number is
 (a) < 2000 (b) between 2000 and 4000 (c) > 4000 (d) < 4000
5. Continuity equation deals with the law of conservation of
 (a) energy (b) mass (c) momentum (d) all of the above
6. The length of the divergent portion of venturimeter in comparison to convergent portion is
 (a) more (b) less (c) same (d) less or more
7. The Mach number is used for model analysis of _____
 (a) pipe flow (b) free surface flow (c) supersonic flow (d) rotational flow
- (b)** Define Following. **07**
 1. Specific Gravity 2. Manometer 3. Buoyancy 4. Reynold's Number
 5. Real Fluid 6. Continuum 7. Momentum
- Q.2 (a)** What is Capillary effect? Explain Capillary rise and capillary fall. **07**
(b) State Hydrostatic law. Derive equation for variation of pressure vertically for a fluid under the gravity. **07**
- OR**
- (b)** A single column manometer is connected to a pipe containing a liquid of specific gravity 0.9 as shown in fig. Find the pressure in pipe if the area of the reservoir is 100 times the area of the tube for the manometer reading as shown in fig. The specific gravity of mercury is 13.6. **04**
- 03**



- Q.3 (a)** Derive formula to determine Metacentric height using experimental method. **07**
(b) A rectangular plate 3m wide and 6m long is immersed in water in such a way as **07**
 (i) Horizontally 1.5 m below the free surface of water (ii) Vertically with 3m side parallel to the water surface and 1m below the free surface of water. Find (a) Total pressure (b) Position of centre of pressure.

OR

- Q.3 (a)** Derive equation to calculate Resultant force and Centre of pressure on a vertical **07**
 plane surface submerged in liquid.
(b) Write a short note on Reynold's experiment. **07**
- Q.4 (a)** Derive momentum equation for 2D and 3D in Cartesian Coordinates. **07**
(b) The water is flowing through a taper pipe of length 100 m having diameter 600 **07**
 mm at the upper end and 300 mm at the lower end, at the rate of 50 litres/sec. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is $19.62 \times 10^4 \text{ N/m}^2$ and lower end is 10 m above datum.

OR

- Q.4 (a)** Write a note on type of forces acting in Moving fluid. **07**
(b) What is fluid? Write a note on Path line, Stream line, Streak line and Stream **07**
 tube.
- Q.5 (a)** Derive Acceleration components for Eulerian and Lagrangian frame of **07**
 reference.
(b) The velocity vector in a flow field is given by $V = 3x^3i - 2x^2yj$. Determine the **07**
 velocity, local acceleration and convective acceleration of a fluid particle in this flow field at (1,3,2). Is this flow steady or unsteady? Is it two or three dimensional?

OR

- Q.5 (a)** Write a note on Principle of Venturimeter and derive an equation for theoretical **07**
 discharge.
(b) Write a note on Kinetic Energy correction factor and Momentum correction **07**
 factor.
