

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Winter 2019 - 20 Examination**

**Semester: 3****Subject Code: 203101205 / 03101203****Subject Name: Fundamentals of Fluid Mechanics****Date: 29/11/2019****Time: 2.00 pm to 4.30 pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions - (Each of one mark) (15)**

1. Dynamic viscosity has dimensions as  
 (a)  $ML^{-1}T^{-1}$                       (b)  $MLT^{-2}$                       (c)  $ML^{-1}T^{-2}$                       (d)  $M^{-1}L^{-1}T^{-1}$
2. Fluid statics deals with  
 (a) viscous and pressure forces                      (b) gravity and pressure force  
 (c) viscous and gravity force                      (d) surface tension and gravity
3. Bernoulli's theorem deals with law of conservation of \_\_\_\_\_.  
 (a) mass                      (b) momentum                      (c) energy                      (d) none of these
4. The velocity distribution at any section in laminar flow through circular pipe is  
 (a) Parabolic                      (b) linear                      (c) logarithmic                      (d) none of these
5. The flowrate through circular pipe is measured by  
 (a) pitot-tube                      (b) Venturimeter                      (c) Rectangular notch                      (d) U-tube manometer
6. Reynolds number is the ratio of \_\_\_\_\_ and \_\_\_\_\_.
7. SI Unit of surface tension coefficient \_\_\_\_\_.
8. The vorticity for irrotational flow is \_\_\_\_\_.
9. The flow where the flow properties do not vary with time is called \_\_\_\_\_ flow.
10. Fluid is a substance that cannot resist \_\_\_\_\_ forces in static condition.
11. Can we have incompressible flow with a compressible fluid? Justify your answer.
12. Which fluids are known as Newtonian fluid?
13. Which molecular phenomenon is responsible for capillary rise and fall?
14. Which device is used to measure stagnation pressure?
15. Which out of the following has higher density? Water or Oil.

**Q.2 Answer the following questions. (Attempt any three) (15)**

- A) State and derive Newton's law of viscosity.
- B) A simple manometer is used to measure the pressure of oil (specific gravity 0.8) flowing in a pipe line. Its right limb is open to atmosphere and left limb is connected to pipe. The centre of pipe is 9 cm below the level mercury (specific gravity 13.6) in the right limb. If the difference of mercury level in the two limbs is 15 cm, determine the absolute pressure of oil in the pipe. (consider 101325 Pa as absolute atmospheric pressure).
- C) Explain streamline, streakline and pathline in brief.
- D) What should be the minimum diameter of the glass tube that is to be used to measure water (specific gravity is 1) level if the capillary rise in the tube is to be restricted to 2 mm. (Consider surface tension coefficient as 0.073575 N/m and angle of contact for water and glass is zero deg.).

**Q.3 A) Derive generalized form of continuity equation in Cartesian coordinate. (07)**

- B) An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the actual discharge of oil through the horizontal venturimeter. (Take  $C_d = 0.98$ )

**OR**

- B) Velocity field of a fluid flow is given by  $\vec{V} = 8x^3 i - 10x^2 y j$ . Determine whether the flow is rotational or irrotational. Also find the velocity magnitude of the fluid at a point (1,2). (08)

**Q.4 A) Explain stability criteria for submerged body with neat sketch. (07)****OR**

- A) What do you mean by Geometric, Kinematic and Dynamic Similarities? Explain each of them in brief. (07)

- B) Differentiate between the following (08)

- (a) Steady flow and Unsteady flow                      (b) Uniform flow and Non-uniform flow