

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B. TECH MIDSEM EXAMINATION**

3<sup>rd</sup> SEMESTER

ACY-2022-23 (ODD SEM)

Subject Name (Code): Introduction to Fluid Mechanics (203104217)

Branch: Civil Engineering

Date: 08-08-2022

Time: 2:30-4:00 PM

Total Marks: 40

Sr. No.		Marks
Q.1	(A) MCQ	05
	<p>(1) The relation between shear stress <math>Z</math> and velocity gradient <math>\frac{du}{dy}</math> of a fluid is given by <math>Z = A \times \left(\frac{du}{dy}\right)^n</math> where <math>A</math> and <math>n</math> are constants. If <math>n &lt; 1</math>, what type of fluid will it be?            a) Newtonian fluid      b) Dilatant      c) Pseudoplastic      d) Bingham plastic</p> <p>(2) Which method is used exclusively in fluid mechanics?            a) Lagrangian method      b) Both Lagrangian and Eulerian methods            c) Eulerian method      d) Neither Lagrangian nor Eulerian method</p> <p>(3) What will be the shape of the pathline for an one-dimensional flow be like?            a) straight line      b) parabolic      c) hyperbolic      d) elliptical</p> <p>(4) The velocity of a point in a flow is            a) along the streamline      b) tangent to the streamline            c) along the pathline      d) tangent to the pathline</p> <p>(5) Which of the following is a shear-thinning fluid?            a) Bingham plastic      b) Rheopectic      c) Dilatant      d) Pseudoplastic</p> <p>(B) fill in the blanks-</p> <p>(1) Path line is _____</p> <p>(2) Stream line is _____</p> <p>(3) Continuity equation _____</p> <p>(4) Density is defined as _____</p> <p>(5) Specific weight is defined as _____</p>	05
Q.2	Attempt any four (Short Questions)	12
	<p>(1) Differentiate between ideal fluid and real fluid.</p> <p>(2) Give any 3 classifications of pressure.</p> <p>(3) Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 7 N.</p> <p>(4) Make sketch and elaborate capillarity effect.</p> <p>(5) Show different types of flows based on Newton's law of viscosity using diagram.</p>	
Q.3	Attempt any two	08
	<p>(1) Two horizontal plates are placed 1.25 cm apart, the space between them being filled with oil of viscosity 14 poises. Calculate the shear stress in oil if upper plate is moved with a velocity of 2.5 m/s.</p>	

(2) Classify types of flow.

(3) A pipe contains an oil of sp. gr. 0.9. A differential manometer connected at the two points A and B shows a difference in mercury level as 15 cm. Find the difference of pressure at the two points.

Q.4

(A) Derive Continuity equation in 3D.

05

(B) Prove hydrostatic law.

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OR

(B) A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and ( a) coincides with water surface, (b) 2.5 m below the free water surface.

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