

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2024****Subject Code: 3153515****Date: 16-05-2024****Subject Name: Elements of Fluid Mechanics****Time: 02:30 PM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
<b>Q.1</b>	(a) Mention any three properties of fluid with relevant units.	<b>03</b>
	(b) Differentiate Newtonian fluid from Non-Newtonian fluids in terms of stress-strain relationship.	<b>04</b>
	(c) A certain mass of liquid has a volume of $5 \text{ m}^3$ and a weight of 39240 N. Find the specific volume, specific weight and specific gravity of the liquid.	<b>07</b>
<b>Q.2</b>	(a) Determine the vacuum pressure in meter of water if the absolute pressure is 0.5434 bar. Assume the atmospheric pressure as 10.33 meter of water.	<b>03</b>
	(b) With a neat sketch mention the various pressure measurement scales.	<b>04</b>
	(c) How U-tube differential manometer is used to measure the difference of pressure between two points of the same pipe?	<b>07</b>
<b>OR</b>		
	(c) Define (i) Vapour pressure (ii) Unsteady flow (iii) Incompressible flow (iv) Uniform flow (v) Reynolds number (vi) Boundary layer (vii) Streamlines.	<b>07</b>
<b>Q.3</b>	(a) What is meant by transition length? How is it related to Reynolds number for the flow of fluid through a pipe?	<b>03</b>
	(b) Discuss the formation of boundary layer in case of flow of fluid through a pipe.	<b>04</b>
	(c) The diameters of the pipe at sections 1-1 and 2-2 are 100 mm and 250 mm respectively. If the discharge through the pipe is $0.06 \text{ m}^3/\text{s}$ , find the average velocities at the two sections.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) What is potential flow? Mention various characteristics potential flow?	<b>03</b>
	(b) What is meant by fanning friction factor? How is it related to pressure drop for flow of fluid in a pipe?	<b>04</b>
	(c) Mention the various representational forms of Fluid flow Energy balance Bernoulli's equation with relevant units.	<b>07</b>
<b>Q.4</b>	(a) Differentiate skin and form friction.	<b>03</b>
	(b) What is meant by Equivalent diameter? How it accounts for flow of fluid through non-circular cross sections?	<b>04</b>
	(c) At a certain section A of a pipeline carrying water the diameter is 1m, the pressure is $98.1 \text{ kN/m}^2$ and the velocity is 3 m/sec. At another section B, which is 2m higher than section A, the diameter is 0.7m and the pressure is $59.2 \text{ kN/m}^2$ . What is the direction of flow?	<b>07</b>
<b>OR</b>		
<b>Q.4</b>	(a) What is meant by characteristic curves in a Centrifugal pump?	<b>03</b>
	(b) With a neat diagram explain how orificemeter is used to measure flow of fluid through a pipe?	<b>04</b>

- (c) Explain with relevant sketches different types of impellers used in Industries? **07**
- Q.5** (a) What is meant by Swirling? Mention the various ways adopted for reducing swirling. **03**
- (b) How agitation operation is different from mixing used in process Industries? **04**
- (c) Describe the various types of heads in a Centrifugal pump? **07**
- OR**
- Q.5** (a) What is cavitation and when priming is required in centrifugal pump? **03**
- (b) What is drag and drag coefficient? Derive the total drag on a solid object aligned at an angle with the direction of flow. **04**
- (c) What is meant by Fluidization and minimum fluidization velocity? Derive an expression for minimum fluidization velocity from first principles. **07**

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