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**School of Engineering**

**Mid - Term Examinations – November 2024**

**Semester:** III

**Date:** 07-11-2025

**Course Code:** CIV2009

**Time:** 02.00pm to 03.30pm

**Course Name:** Fluid Mechanics

**Max Marks:** 50

**Program:** B-Tech

**Weightage:** 25%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.  
(ii) Do not write anything on the question paper other than roll number.  
(iii) Scientific and Non-programmable calculators are permitted

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**Part A**

**Answer ALL the Questions. Each question carries 2marks.**

**5Qx2M=10M**

- |          |   |                |           |            |
|----------|---|----------------|-----------|------------|
| <b>1</b> | List any two applications of fluid mechanics                | <b>2 Marks</b> | <b>L1</b> | <b>CO1</b> |
| <b>2</b> | Define the following<br>a) Internal flow and external flow  | <b>2 Marks</b> | <b>L1</b> | <b>CO1</b> |
| <b>3</b> | What is surface tension of fluid?                           | <b>2 Marks</b> | <b>L1</b> | <b>CO1</b> |
| <b>4</b> | Define the following<br>a) Unit weight and Specific volume. | <b>2 Marks</b> | <b>L1</b> | <b>CO1</b> |
| <b>5</b> | Show the effect of shear stress on solids and fluids        | <b>2 Marks</b> | <b>L1</b> | <b>CO1</b> |

**Part B**

**Answer ALL Questions. Each question carries 10 marks.**

**4QX10M=40M**

- |          |  |               |           |            |
|----------|--|---------------|-----------|------------|
| <b>6</b> | <b>6a</b> Compare wetting fluid and non-wetting fluid  | <b>4Marks</b> | <b>L2</b> | <b>CO1</b> |
|          | <b>6b</b> A capillary tube of 1.2 mm diameter is immersed vertically in water exposed to the atmosphere. Determine how high water will rise in the tube. Take the contact angle at the inner wall of the tube to be $60^\circ$ and the surface tension to be 1.00 N/m. | <b>6Marks</b> | <b>L2</b> | <b>CO1</b> |

Or

- 7    **7a**    Fluids like oil that have a tendency to exert very high pressure or force. These fluids can be used for lifting various heavy loads. With the help of neat diagram explain the working principal of hydraulic lift.    **5Marks**    **L2**    **C01**
- 7b**    A 0.6-mm-diameter glass tube is inserted into water at 20°C in a cup as shown in figure. Determine the capillary rise of water in the tube. Take surface tension of water at 20°C is 0.073 N/m.    **5Marks**    **L2**    **C01**
- 8    **8a**    With the help of neat sketch compare viscous and Inviscid Regions of flow    **5Marks**    **L2**    **C02**
- 8b**    Classify the fluid flow based on Reynolds number, if a fluid of viscosity 0.32 Ns/m<sup>2</sup> and relative density of 1400 Kg/m<sup>3</sup> through a 30 mm pipe with a Velocity of 3.6 m/s?    **5Marks**    **L2**    **C02**

Or

- 9    **9a**    Compare laminar and turbulent flow with the help of neat sketch    **5Marks**    **L2**    **C02**
- 9b**    Classify the fluid flow based on Reynolds number, if a fluid flows through a diameter of 50 mm with velocity 2.5 m/s having density of 1200 Kg/m<sup>3</sup> and having viscosity of 0.6 Ns/m<sup>2</sup>.    **5Marks**    **L2**    **C02**
- 10   **10a**   Define viscosity and show the relation between shear stress and rate of change of velocity based on newton's law of viscosity    **2Marks**    **L1**    **C01**
- 10b**   Calculate dynamic viscosity of an oil which is used for lubrication between a square plate of size 0.8 m X 0.8 m and an inclined plane with angle of inclination of 30° as shown in figure1. The weight of the square plate is 300 N it slides down the inclined plane with the uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm.    **8Marks**    **L2**    **C01**

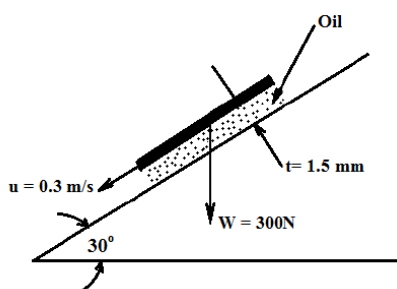


Figure1

Or

- 11 11a** Compare Steady flow and unsteady flow using velocity vs time graph **4Marks L2 C02**
- 11b** A Plate at a distance 1.2 mm from a fixed plate moves at 0.45 m/s and requires a force of 1.982N/m<sup>2</sup> area of plate. Determine dynamic viscosity of liquid between the plates **6Marks L2 C01**
- 12** The left leg of a U-tube mercury manometer is connected to a pipe-line conveying water, the level of mercury in the leg being 0.6 m below the center of pipe-line, and the right leg is open to atmosphere is shown in figure2. The level of mercury in the right leg is 0.45 m above that in the left leg and the space above mercury in the right leg contains Benzene (specific gravity 0.88) to a height of 0.3 m. Find the pressure in the pipe. **10Marks L3 C01**

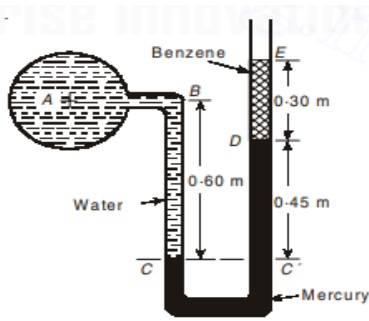


Figure2

Or

- 13 13a** With help of neat diagram explain the relation between absolute pressure, atmospheric pressure and gauge pressure **5Marks L2 C02**
- 13b** A manometer is used to measure the pressure of a gas in a tank. The fluid used has a specific gravity of 0.85, and the manometer column height is 55 cm, as shown in figure3. If the local atmospheric pressure is 96 kPa, determine the absolute pressure within the tank. **5Marks L3 C01**

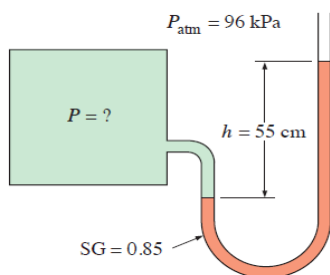


Figure3