Civil Engineering Licensure Exam – Mock Exam (Day 15: Fluid Mechanics – Properties, Static Forces, and Pressure)

February 24, 2025

Instructions

- Time Limit: 60 Minutes

- Coverage: Fluid Mechanics – Properties, Static Forces, and Pressure

- Total Questions: 10 (Multiple Choice & Problem-Solving)

- Show complete solutions for problem-solving questions.

Section A: Multiple Choice Questions (MCQs)

Choose the best answer.

1. The unit of dynamic viscosity in SI units is:

   (a) Pascal-second (Pa·s)

   (b) Newton per meter (N/m)

   (c) Joule per cubic meter (J/m³)

   (d) Kilogram per second (kg/s)

2. The specific weight of water at standard conditions is approximately:

   (a) 9.81 kN/m³

   (b) 1.00 kN/m³

   (c) 62.4 N/m³

(d) 1000 kg/m³

3. Pressure intensity at a point in a fluid at rest is the same in all directions due to:

   (a) Pascal's Law

   (b) Bernoulli's Principle

   (c) Newton's Second Law

   (d) Archimedes' Principle

4. The absolute pressure at a depth of 5 m in water (density = 1000 kg/m³) is approximately:

   (a) 49.05 kPa

   (b) 50.65 kPa

   (c) 101.3 kPa

   (d) 150.35 kPa

5. The center of pressure of a submerged plane surface is always:

   (a) Above the centroid of the surface

   (b) Below the centroid of the surface

   (c) At the centroid of the surface

   (d) Independent of fluid properties

Section B: Problem-Solving

1. A cylindrical tank with a radius of 1.2 m is filled with water to a height of 3 m. Determine the total hydrostatic force acting on the bottom of the tank.

2. A plate of 1.5 m × 2.5 m is submerged vertically in water with its top edge at 2 m below the surface. Determine the total hydrostatic force acting on the plate.

3. A U-tube manometer contains mercury (specific gravity = 13.6) and is used to measure the pressure difference between two points. If the height difference between the mercury columns is 0.25 m, determine the pressure difference.

4. A pipeline carries oil (specific gravity = 0.85). If the absolute pressure at a section of the pipe is 250 kPa, determine the gauge pressure.

5. A submerged rectangular gate is 3 m wide and 4 m high, with its top edge at the water surface. Determine the location of the center of pressure.