Civil Engineering Licensure Exam – Mock Exam (Day 16: Flow of Fluids – Bernoulli's Equation and Flow Continuity)

February 24, 2025

Instructions

- Time Limit: 60 Minutes
- Coverage: Flow of Fluids – Bernoulli's Equation and Flow Continuity
- 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 principle of conservation of mass in fluid mechanics is represented by:
   (a) Bernoulli's equation
   (b) The continuity equation
   (c) Pascal's law
   (d) Newton's second law
2. The Bernoulli equation is derived from the principle of:
   (a) Conservation of mass
   (b) Conservation of momentum

(c) Conservation of energy

(d) Archimedes' Principle

3. The continuity equation states that for an incompressible fluid, the product of cross-sectional area and velocity is:

   (a) Constant

   (b) Proportional to pressure

   (c) Inversely proportional to density

   (d) Dependent on pipe length

4. Bernoulli's equation applies to:

   (a) Viscous flows only

   (b) Steady, incompressible, inviscid flows

   (c) Unsteady flows with friction

   (d) High-density compressible flows

5. If the velocity of a fluid in a pipe doubles, the pressure:

   (a) Increases

   (b) Decreases

   (c) Remains unchanged

   (d) Depends on the type of fluid

Section B: Problem-Solving

1. A pipe carrying water has a diameter of 0.3 m at section 1 and 0.2 m at section 2. If the velocity at section 1 is 3 m/s, determine the velocity at section 2 using the continuity equation.

2. A water pipeline reduces in diameter from 0.4 m to 0.2 m. If the initial velocity is 2.5 m/s, determine the velocity at the smaller section.

3. Water flows in a horizontal pipe with a velocity of 4 m/s and a pressure of 150 kPa. At a constriction, the velocity increases to 6 m/s. Determine the pressure at the constriction using Bernoulli's equation.

4. A reservoir supplies water to a pipe at a height of 15 m. If the pipe discharges freely at ground level, determine the velocity of the exiting water using Bernoulli's equation.

5. A pipeline carries oil (specific gravity = 0.85). The velocity at point A is 2 m/s with a pressure of 200 kPa, and at point B, the velocity is 5 m/s. Determine the pressure at point B using Bernoulli's equation.