# Civil Engineering Licensure Exam – Mock Exam (Day 41: Problem-Solving on Stress-Strain Relationships)

## February 24, 2025

## Instructions

- Time Limit: 60 Minutes
- Coverage: Problem-Solving on Stress-Strain Relationships
- 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 modulus of elasticity (Young's modulus) is defined as:

    (a) The ratio of stress to strain in the elastic region
    (b) The ratio of strain to stress
    (c) The maximum stress before failure
    (d) The resistance to shear force

2. Poisson's ratio is the ratio of:

    (a) Lateral strain to axial strain
    (b) Axial strain to lateral strain
    (c) Stress to strain

(d) Shear strain to axial strain

3. A ductile material exhibits:

   (a) Significant plastic deformation before failure

   (b) Brittle fracture without yielding

   (c) No deformation under stress

   (d) No elastic limit

4. Hooke's law states that:

   (a) Stress is proportional to strain within the elastic limit

   (b) Stress and strain are always inversely proportional

   (c) The material will deform permanently under any stress

   (d) The modulus of elasticity varies with load

5. The ultimate tensile strength (UTS) of a material is:

   (a) The maximum stress a material can withstand before breaking

   (b) The stress at which the material first yields

   (c) The stress at the proportional limit

   (d) The force applied per unit length

# Section B: Problem-Solving

1. A steel rod has a cross-sectional area of 150 mm$^2$ and is subjected to a tensile force of 60 kN. Determine the normal stress in the rod.

2. A cylindrical bar of length 1.5 m and diameter 30 mm elongates by 1.2 mm under a tensile load. Determine the strain in the bar.

3. A concrete column has a compressive stress of 20 MPa. If the modulus of elasticity of concrete is 25 GPa, determine the axial strain.

4. A steel bar has a lateral strain of $3 \times 10^{-4}$ when subjected to an axial strain of $1.5 \times 10^{-3}$. Determine Poisson's ratio.

5. A tensile test is conducted on a steel specimen. If the ultimate tensile force is 80 kN and the original cross-sectional area is 250 mm$^2$, determine the ultimate tensile strength (UTS).