Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 36: Stresses and Strains in Materials)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. The unit of stress in SI: **(a) Pascal (Pa)**
2. Strain is defined as: **(b) The deformation per unit length**
3. Hooke's Law states that: **(a) Stress is proportional to strain within the elastic limit**
4. Poisson's ratio is: **(a) The ratio of lateral strain to axial strain**
5. Modulus of elasticity for steel: **(a) 200 GPa**

Section B: Problem-Solving Solutions

1. Stress in the steel rod:

$$\sigma = \frac{F}{A} = \frac{50,000}{100 \times 10^{-6}}$$
$$= 500 \text{ MPa}$$

2. Strain in the bar:

$$\varepsilon = \frac{\Delta L}{L} = \frac{1.5 \times 10^{-3}}{2}$$
$$= 7.5 \times 10^{-4}$$

3. Strain in the steel bar:

$$\varepsilon = \frac{\sigma}{E} = \frac{100 \times 10^6}{200 \times 10^9}$$
$$= 5 \times 10^{-4}$$

4. Poisson's ratio:

$$\nu = \frac{\text{lateral strain}}{\text{axial strain}} = \frac{2 \times 10^{-5}}{1 \times 10^{-3}}$$
$$= 0.02$$

5. Compressive stress in concrete column:

$$\sigma = \frac{F}{A} = \frac{2000 \times 10^3}{0.2}$$
$$= 10 \text{ MPa}$$