Civil Engineering Licensure Exam – Mock Exam (Day 37: Axial, Shear, and Flexural Stresses)

February 24, 2025

Instructions

- Time Limit: 60 Minutes
- Coverage: Axial, Shear, and Flexural Stresses
- 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. Axial stress in a structural member is given by:
   (a) $\sigma = \frac{F}{A}$
   (b) $\tau = \frac{VQ}{Ib}$
   (c) $\sigma = \frac{M}{S}$
   (d) $\tau = \frac{P}{A}$
2. The flexural stress in a beam is determined using:
   (a) $\sigma = \frac{My}{I}$
   (b) $\sigma = \frac{P}{A}$
   (c) $\tau = \frac{VQ}{Ib}$

(d) $\sigma = \frac{F}{A}$

3. Shear stress in a beam varies:

   (a) Linearly across the section

   (b) Parabolically across the section

   (c) Uniformly across the section

   (d) Constant at every point

4. The neutral axis of a beam in bending is:

   (a) The axis where the bending stress is zero

   (b) The axis of maximum bending stress

   (c) The centroid of the beam

   (d) The axis where shear force is maximum

5. The section modulus of a beam is given by:

   (a) $S = \frac{I}{c}$

   (b) $S = \frac{M}{\sigma}$

   (c) $S = \frac{F}{A}$

   (d) $S = \frac{Q}{V}$

Section B: Problem-Solving

1. A steel rod with a cross-sectional area of 150 mm^2 is subjected to an axial tensile force of 60 kN. Determine the axial stress in the rod.

2. A simply supported beam of span 5 m carries a central concentrated load of 20 kN. Determine the maximum bending stress if the beam has a rectangular cross-section of 200 mm width and 300 mm depth.

3. A beam with an I-section has a moment of inertia of 8×10^6 mm^4 and is subjected to a shear force of 40 kN. Determine the maximum shear stress if the width of the web is 10 mm and the first moment of area Q is 6×10^5 mm^3.

4. A concrete beam has a section modulus of 500 mm^3 and is subjected to a maximum bending moment of 25 kN·m. Determine the maximum flexural stress.

5. A rectangular beam of 100 mm width and 250 mm depth is subjected to a shear force of 30 kN. Determine the maximum shear stress using the shear formula.