Civil Engineering Licensure Exam – Mock Quiz (Day 42: Mechanics of Materials)

February 24, 2025

Instructions

- Time Limit: 60 Minutes

- Coverage: Mechanics of Materials

- 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 rigidity (shear modulus) is given by:

    (a) The ratio of shear stress to shear strain

    (b) The ratio of normal stress to normal strain

    (c) The ratio of axial stress to lateral strain

    (d) The ratio of bending moment to shear force

2. In a cantilever beam subjected to a point load at the free end, the maximum bending moment occurs at:

    (a) The fixed support

    (b) The free end

    (c) The midspan

(d) A quarter span from the support

3. The shear force at the midpoint of a simply supported beam subjected to a uniform load is:

   (a) Zero

   (b) Maximum

   (c) Equal to the reaction at the support

   (d) Equal to the moment at the midpoint

4. The stress-strain curve of a ductile material consists of:

   (a) Elastic and plastic regions

   (b) Only an elastic region

   (c) No defined yield point

   (d) Only a failure point

5. The maximum normal stress in a beam subjected to pure bending occurs:

   (a) At the extreme fibers of the section

   (b) At the neutral axis

   (c) At the centroid

   (d) At midspan only

Section B: Problem-Solving

1. A circular rod with a diameter of 25 mm is subjected to an axial tensile force of 50 kN. Determine the normal stress in the rod.

2. A simply supported beam with a span of 4 m carries a concentrated load of 30 kN at midspan. Determine the maximum bending moment.

3. A cantilever beam of length 3 m carries a uniform load of 5 kN/m. Determine the maximum bending moment.

4. A structural element is subjected to a normal stress of 80 MPa in the x-direction and 40 MPa in the y-direction, with a shear stress of 30 MPa. Determine the principal stresses using Mohr's Circle.

5. A shaft is subjected to a torque of 2000 N·m. If its polar moment of inertia is 6×10^6 mm^4 and its outer radius is 50 mm, determine the maximum shear stress.