Civil Engineering Licensure Exam – Mock Exam (Day 34: Structural Stability and Determinacy)

February 24, 2025

Instructions

- Time Limit: 60 Minutes
- Coverage: Structural Stability and Determinacy
- 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. A structure is statically determinate when:

    (a) The number of unknown forces equals the number of independent equations of equilibrium.
    (b) The structure has more unknowns than equations.
    (c) It is able to resist external loads without any supports.
    (d) The structure deforms under any applied load.

2. The equation for determining the determinacy of a plane truss is:

    (a) $m = 2j - 3$
    (b) $m = j + 3$

(c) $m = 2j - r$

(d) $m = 3j - 2$

3. A statically indeterminate beam has:

   (a) More unknowns than available equations of equilibrium.

   (b) The same number of equations and unknowns.

   (c) No reactions at supports.

   (d) No shear force in its diagram.

4. The degree of indeterminacy of a fixed beam with two spans is:

   (a) 0

   (b) 1

   (c) 3

   (d) 4

5. A structure is considered unstable if:

   (a) It has insufficient supports or an improper arrangement of supports.

   (b) It has more supports than required.

   (c) It satisfies the equation $m = 2j - 3$.

   (d) The number of reactions equals the number of equations.

Section B: Problem-Solving

1. A truss has 10 joints and 19 members. Determine if the truss is statically determinate or indeterminate.

2. A beam is simply supported at both ends and has an intermediate hinge. Determine the degree of static determinacy.

3. A frame consists of 4 members and 4 joints, with 3 support reactions. Determine if the structure is determinate, indeterminate, or unstable.

4. A continuous beam has three spans with fixed ends. Calculate the degree of static indeterminacy.

5. A planar structure has 6 joints, 13 members, and 3 external reactions. Determine if the structure is statically determinate, indeterminate, or unstable.