Civil Engineering Licensure Exam – Mock Quiz (Day 48: Concrete and Steel Structures)

February 24, 2025

Instructions

- Time Limit: 60 Minutes
- Coverage: Concrete and Steel Structures
- 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 primary function of reinforcement in concrete structures is to:
   (a) Resist tensile forces
   (b) Resist compressive forces
   (c) Prevent cracking due to temperature changes
   (d) Reduce the weight of concrete
2. The effective depth of a reinforced concrete beam is measured from:
   (a) The top fiber to the centroid of reinforcement
   (b) The bottom fiber to the neutral axis
   (c) The centroid to the extreme fiber
   (d) The top fiber to the bottom fiber

3. The lateral-torsional buckling in a steel beam is prevented by:

   (a) Providing lateral bracing
   (b) Reducing the beam length
   (c) Increasing the beam depth
   (d) Using more reinforcement

4. The yield strength of structural steel typically used in beams and columns is:

   (a) 250 MPa
   (b) 100 MPa
   (c) 500 MPa
   (d) 700 MPa

5. Shear reinforcement in reinforced concrete beams is primarily provided using:

   (a) Stirrups
   (b) Main longitudinal bars
   (c) Lateral ties
   (d) Compression reinforcement

Section B: Problem-Solving

1. A reinforced concrete beam has a width of 300 mm and an effective depth of 500 mm. If the tensile reinforcement consists of three 20 mm diameter bars, determine the total area of steel reinforcement.

2. A simply supported steel beam of span 8 m carries a uniform load of 30 kN/m. Determine the maximum bending moment.

3. A steel column has a slenderness ratio of 50 and a critical buckling load of 600 kN. Determine the effective length if the radius of gyration is 100 mm.

4. A concrete column has a gross area of 400 cm^2 and carries an axial load of 1200 kN. Determine the axial stress in the column.

5. A reinforced concrete beam has a factored shear force of 100 kN. Determine the required spacing of stirrups assuming $f_y = 415$ MPa and the stirrup bar diameter is 12 mm.