Civil Engineering Licensure Exam – Mock Exam (Day 40: Connections – Bolted and Welded Joints)

February 24, 2025

Instructions

- Time Limit: 60 Minutes
- Coverage: Connections – Bolted and Welded Joints
- 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 mode of failure in a bolted joint due to tension is:
   (a) Bearing failure
   (b) Shear failure
   (c) Tension failure of the plate
   (d) Block shear failure
2. The efficiency of a bolted joint depends on:
   (a) The number of bolts only
   (b) The strength of the plate, bolt diameter, and pitch spacing
   (c) The weld strength only

(d) The width of the plate only

3. A fillet weld is designed based on:

   (a) The throat thickness of the weld
   (b) The length of the weld only
   (c) The width of the weld
   (d) The penetration depth

4. The strength of a welded joint depends on:

   (a) The type of welding process used
   (b) The quality of the weld and its geometry
   (c) The base metal thickness only
   (d) The type of electrode used only

5. In a bolted connection subjected to shear, the shear capacity of a bolt is given by:

   (a) $V = \frac{A_b F_u}{\gamma_m}$
   (b) $V = \frac{A_g F_y}{\gamma_m}$
   (c) $V = \frac{F_y}{\gamma_m}$
   (d) $V = \frac{A_b}{\gamma_m}$

Section B: Problem-Solving

1. A bolted joint uses M20 bolts (20 mm diameter) in double shear. If the allowable shear stress in the bolt is 150 MPa, determine the shear strength of a single bolt.

2. A steel plate with a thickness of 10 mm is welded with a 6 mm fillet weld along a length of 200 mm. If the allowable shear stress in the weld is 120 MPa, determine the strength of the welded joint.

3. A bolted lap joint consists of a steel plate with a width of 100 mm and a thickness of 8 mm. The joint has two M16 bolts (16 mm diameter) in single shear. Determine the shear strength of the connection if the allowable shear stress of the bolts is 140 MPa.

4. A welded connection consists of a fillet weld with a throat thickness of 5 mm and a length of 250 mm. Determine the load-carrying capacity of the weld if the allowable shear stress is 110 MPa.

5. A bolted joint is subjected to a tensile force of 80 kN. If the plate is 12 mm thick and has a width of 120 mm, determine the bearing capacity of the joint assuming an allowable bearing stress of 180 MPa.