Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 30: Truss Analysis – Method of Joints and Sections)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. A truss is composed of: **(b) Slender members connected at joints**
2. The method of joints is based on: **(a) Summation of forces at each joint**
3. A zero-force member: **(c) Carries no force under specific loading conditions**
4. The method of sections is useful when: **(b) Finding forces in specific members without solving the entire truss**
5. A simple truss is statically determinate if: **(a)** $m = 2j - 3$

Section B: Problem-Solving Solutions

1. Determining if the truss is statically determinate:

$$m = 2j - 3$$

$$11 = 2(6) - 3$$

$$11 = 12 - 3 = 9 \quad \text{(not equal, so the truss is indeterminate)}$$

2. Force in members using the method of joints:

$$\sum F_x = 0, \quad \sum F_y = 0$$

$$F_{AC} \cos 45^\circ + F_{BC} = 0$$

$$F_{AC} \sin 45^\circ = 200N$$

Solving for forces yields $F_{AC} = 282.8N$ (tension) and $F_{BC} = -200N$ (compression).

3. Force in the diagonal member of the Pratt truss: Using method of sections and summing moments at the cut section:

$$F_D = \frac{(10 \times 4)}{3} = 13.33kN$$

4. Identifying zero-force members:

   - If two non-collinear members meet at a joint with no external load, both members are zero-force members.
   - If three members form a truss joint and two are collinear with no external load, the non-collinear member is a zero-force member.

5. Force in a diagonal member of a Warren truss: Using the method of sections and summing moments:

$$F = \frac{5 \times 4}{3} = 6.67kN$$