Answer Key: Civil Engineering Licensure Exam – Mock Quiz (Day 35: Structural Analysis)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. A statically determinate structure: **(a) The number of reactions equals the number of equilibrium equations.**
2. The moment distribution method is used for: **(c) Indeterminate beams and frames.**
3. The influence line for a bending moment: **(a) The variation of bending moment at that point due to a moving load.**
4. The slope-deflection method is based on: **(b) Compatibility conditions and moment equilibrium.**
5. In the stiffness method, the primary unknowns are: **(a) Displacements.**

Section B: Problem-Solving Solutions

1. Simply supported beam with point load:

$$R_A + R_B = 20 \text{ kN}$$

Using moments about A:

$$R_B \times 8 = 20 \times 3$$

$$R_B = 7.5 \text{ kN}, \quad R_A = 12.5 \text{ kN}$$

Maximum moment at the point load:

$$M_{\max} = R_A \times 3 = 12.5 \times 3 = 37.5 \text{ kN·m}$$

2. Propped cantilever beam:

Reactions at A and B using force method

$$R_A = 10kN, R_B = 14kN$$

3. Moment distribution method:

$$M_{\max} = \frac{wL^2}{8} = \frac{3 \times 5^2}{8} = 9.375 \text{ kN·m}$$

4. Three-hinged arch:

$$H_A = \frac{PL}{4h} = \frac{15 \times 12}{4 \times 3} = 15 \text{ kN}$$

5. Slope-deflection method:

$$M_A = \frac{EI}{L}\theta = 50 \text{ kN·m}$$