Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 49: Review of Past PRC Exam Questions)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. The ultimate load design method considers: **(a) The maximum load a structure can withstand before failure**
2. The modulus of elasticity of concrete depends on: **(a) The strength of concrete**
3. Bernoulli's equation is based on: **(a) Conservation of energy**
4. Plasticity index in soil mechanics: **(a) The difference between the liquid limit and plastic limit**
5. LRFD load combinations include: **(a) Dead and live loads with load factors**

Section B: Problem-Solving Solutions

1. Required tensile reinforcement:

$$A_s = \frac{M}{0.87 f_y d}$$

$$= \frac{150 \times 10^6}{0.87 \times 415 \times 500}$$

$$= 830 \text{ mm}^2$$

2. Froude number:

$$F_r = \frac{V}{\sqrt{gD}}$$
$$= \frac{12/(3 \times 1.5)}{\sqrt{9.81 \times 1.5}}$$
$$= \frac{2.67}{3.83}$$
$$= 0.70$$

3. Slenderness ratio:

$$\lambda = \frac{L_{\text{eff}}}{r}$$
$$= \frac{4000}{150}$$
$$= 26.67$$

4. Plasticity index:

$$PI = LL - PL$$
$$= 50 - 20$$
$$= 30$$

5. Maximum bending moment for simply supported beam:

$$M_{\max} = \frac{wL^2}{8}$$
$$= \frac{25 \times 5^2}{8}$$
$$= 78.125 \text{ kN·m}$$