Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 20: Drainage, Stormwater Management, and Irrigation Systems)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. Primary objective of stormwater drainage: **(b) Reduce flooding by directing runoff efficiently**
2. The Rational Method is used to: **(a) Estimate peak runoff discharge**
3. Purpose of a detention basin: **(a) Store stormwater temporarily and release it slowly**
4. "Duty of water" in irrigation refers to: **(a) The amount of water required per unit crop area**
5. Manning's equation is used to compute: **(b) The velocity of water flow in an open channel**

Section B: Problem-Solving Solutions

1. Peak runoff using the Rational Method:

$$Q = CIA$$

$$= 0.7 \times 50 \times 10$$

$$= 350 \text{ m}^3/\text{hr} = \frac{350}{3600} = 0.0972 \text{ m}^3/\text{s}$$

2. Discharge in stormwater channel:

$$Q = AV$$

$$A = 2 \times 1.2 = 2.4 \text{ m}^2$$

$$Q = 2.4 \times 1.8 = 4.32 \text{ m}^3/\text{s}$$

3. Total stormwater volume in detention basin:

$$V = A \times \text{Rainfall Depth}$$

$$= 5 \times 10^4 \times \frac{80}{1000}$$

$$= 4,000 \text{ m}^3$$

4. Total irrigation volume required:

$$V = \text{Irrigation Rate} \times \text{Area}$$

$$= \frac{25}{1000} \times 2 \times 10^4$$

$$= 500 \text{ m}^3/\text{day}$$

5. Flow velocity using Manning's equation:

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$

$$= \frac{1}{0.015} (0.5)^{2/3} (0.001)^{1/2}$$

$$= 3.57 \times 0.63 \times 0.0316 = 0.071 \text{ m/s}$$