Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 18: Hydrology – Rainfall, Runoff, and Groundwater Flow)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. Hydrologic cycle refers to: **(a) The movement of water through the environment**
2. Rainfall intensity is measured in: **(c) Millimeters per hour**
3. The Rational Method estimates: **(b) Peak runoff from a watershed**
4. Infiltration refers to: **(b) The movement of water into the soil**
5. The water table represents: **(c) The upper surface of the zone of saturation**

Section B: Problem-Solving Solutions

1. Average rainfall intensity:

$$I = \frac{\text{Rainfall Depth}}{\text{Time Duration}}$$

$$= \frac{25 \text{ mm}}{5 \text{ hr}} = 5 \text{ mm/hr}$$

2. Peak runoff using the Rational Method:

$$Q = CIA$$

$$= (0.6) \times (50 \text{ mm/hr}) \times (2 \times 10^6 \text{ m}^2)$$

Convert mm/hr to $\mathbf{m^3}$/s:

$$Q = 0.6 \times \frac{50}{1000} \times 2,000,000 \times \frac{1}{3600}$$

$$= 16.67 \text{ m}^3/\text{s}$$

3. Total infiltration volume:

$$I = \text{Infiltration Rate} \times \text{Time Duration}$$

$$= 5 \text{ mm/hr} \times 3 \text{ hr} = 15 \text{ mm}$$

Convert mm to meters:

$$= 0.015 \text{ m}$$

$$V = \text{Area} \times \text{Depth}$$

$$= 500 \times 0.015 = 7.5 \text{ m}^3$$

4. Darcy velocity:

$$v = K \times \frac{\Delta h}{L}$$

$$= 10 \times \frac{3}{500} = 0.06 \text{ m/day}$$

5. Total river discharge:

$$Q_{\text{total}} = Q_{\text{base flow}} + Q_{\text{runoff}}$$

$$= 2 + 8 = 10 \text{ m}^3/\text{s}$$