Answer Key: Civil Engineering Licensure Exam – Mock Quiz (Day 28: Engineering Economy and Construction Management)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. The time value of money concept: **(b) Money today is worth more than the same amount in the future.**
2. Net Present Value (NPV): **(b) The difference between present benefits and present costs.**
3. The critical path represents: **(a) The longest path through the network diagram.**
4. Break-even analysis determines: **(b) The point at which total revenue equals total cost.**
5. A fast-tracked construction project: **(b) Design and construction phases overlap to reduce project duration.**

Section B: Problem-Solving Solutions

1. Net Present Value (NPV):

$$NPV = \sum \frac{B_t}{(1+i)^t} - C_0$$

Using present value factor for annuities:

$$PV = 50,000 \times 4.623$$

$$= 231,150$$

$$NPV = 231,150 - 200,000 = 31,150$$

2. Present worth of maintenance costs:

$$PW = 5,000 \times \left(\frac{1 - (1.06)^{-5}}{0.06} \right)$$

Using factor:

$$PW = 5,000 \times 4.2124 = 21,062$$

3. Comparing NPV for projects A and B:

$$PV_A = 45,000 \times 4.1002 = 184,509$$

$$NPV_A = 184,509 - 150,000 = 34,509$$

$$PV_B = 40,000 \times 4.1002 = 164,008$$

$$NPV_B = 164,008 - 120,000 = 44,008$$

Project B has a higher NPV.

4. Break-even margin:

$$\begin{aligned} \text{Break-even margin} &= \frac{\text{Revenue} - \text{Cost}}{\text{Revenue}} \times 100\% \\ &= \frac{500,000 - 300,000}{500,000} \times 100\% \\ &= 40\% \end{aligned}$$

5. Critical Path and Project Duration:

$$\text{Path 1: A} \rightarrow \text{B} \rightarrow \text{D } (5 + 7 + 8 = 20)$$

$$\text{Path 2: A} \rightarrow \text{C} \rightarrow \text{D } (5 + 6 + 8 = 19)$$

$$\text{Critical Path: A} \rightarrow \text{B} \rightarrow \text{D (20 days)}$$