Civil Engineering Licensure Exam – Mock Exam (Day 2: Logarithms, Exponentials, and Progressions)

February 23, 2025

Instructions

- Time Limit: 60 Minutes
- Coverage: Logarithms, Exponentials, and Progressions
- Total Questions: 10 (Multiple Choice & Problem-Solving)
- Show complete solutions for problem-solving questions.

Section A: Multiple Choice Questions (MCQs)

Choose the best answer.

1. Solve for x in the equation:

$$\log_2(x+1) = 3$$

   (a) $x = 7$
   (b) $x = 8$
   (c) $x = 9$
   (d) $x = 10$

2. If $\log_5 125 = x$, what is the value of x?

   (a) 2
   (b) 3

(c) 4

(d) 5

3. Which of the following is equivalent to $e^{\ln 7}$?

   (a) 1

   (b) 7

   (c) e^7

   (d) $\ln 7$

4. The sum of the first n terms of an arithmetic sequence is given by:

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

   What is the sum of the first 10 terms if $a = 2$ and $d = 3$?

   (a) 120

   (b) 125

   (c) 130

   (d) 135

5. The fourth term of a geometric sequence is 81, and the first term is 3. What is the common ratio?

   (a) 2

   (b) 3

   (c) 4

   (d) 5

Section B: Problem-Solving

1. Solve for x in the equation:

$$3^{x+1} = 27$$

2. Expand and simplify:

$$\log(a^2b^3) - 2\log b + \log \frac{1}{a}$$

3. If the population of a city follows the exponential growth model:

$$P(t) = P_0 e^{0.03t}$$

where $P_0 = 5000$ and t is in years, find the population after 5 years.

4. Find the sum of the first 15 terms of an arithmetic sequence where $a = 4$ and $d = 6$.

5. A ball bounces to 80% of its previous height. If it is dropped from a height of 10 meters, what is the total vertical distance it travels before coming to rest?