

Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 50: Soil Classification and Index Properties)

February 24, 2025

Answer Key

Section A: Multiple Choice Solutions

1. The liquid limit of a soil is: **(a) The moisture content at which soil changes from plastic to liquid state**
2. The plasticity index (PI) is: **(a) The difference between liquid limit and plastic limit**
3. The most widely used soil classification system: **(a) Unified Soil Classification System (USCS)**
4. A fine-grained soil with $PI > 50$ is: **(a) Highly plastic clay (CH)**
5. The specific gravity of soil is: **(a) The ratio of the unit weight of soil solids to the unit weight of water**

Section B: Problem-Solving Solutions

1. Plasticity index:

$$\begin{aligned}PI &= LL - PL \\ &= 45 - 20 \\ &= 25\end{aligned}$$

2. Bulk unit weight:

$$\begin{aligned}\gamma &= \gamma_d(1 + w) \\ &= 16.5(1 + 0.12) \\ &= 18.48 \text{ kN/m}^3\end{aligned}$$

3. Dry unit weight:

$$\begin{aligned}\gamma_d &= \frac{G_s \gamma_w}{1 + e} \\ &= \frac{2.65 \times 9.81}{1 + 0.7} \\ &= \frac{25.99}{1.7} \\ &= 15.29 \text{ kN/m}^3\end{aligned}$$

4. Liquidity index:

$$\begin{aligned}LI &= \frac{w - PL}{PI} \\ &= \frac{40 - 22}{50 - 22} \\ &= \frac{18}{28} \\ &= 0.64\end{aligned}$$

5. Shrinkage index:

$$\begin{aligned}SI &= PL - SL \\ &= 25 - 15 \\ &= 10\end{aligned}$$