



UNIVERSITY

**FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
SECOND SEMESTER EXAMINATION
(AUGUST 2018)
2017/2018 ACADEMIC SESSION**

Course Title: Soil Mechanics

Course Code: CVE 306

HOD'S SIGNATURE

Instructions:

- 1) Answer Any FIVE Questions**
- 2) Time Allowed: 3 hours**
- 3) SEVERE PENALTIES APPLY FOR MISCONDUCT,
CHEATING, POSSESSION OF
UNAUTHORIZED MATERIALS DURING
EXAMINATION**

ELIZADE UNIVERSITY
DEPARTMENT OF CIVIL ENGINEERING
B.Sc. (Civil Engineering) Degree Examination
Second Semester 2017/2018 Examination
CVE 306: Soil Mechanics Units: 3 Time Allowed: 3Hrs

INSTRUCTION: Answer Any FIVE Questions

Question 1 (20 marks)

- a. Explain steps taken in classifying soils using Unified Soil Classification System (USCS) (8 marks)
- b. The particle size analysis curves in Figure Q1 were taken from student's laboratory report book. the soils A and B liquid limit values were 30 and 26% and their plastic limit values were 22 and 20 % respectively. Classify the two soils using USCS method? Use the Figure 2 for relevant information. (8 marks)
- c. State the precautionary taken to ensure high level of accuracy during sieve analysis test. (4 marks)

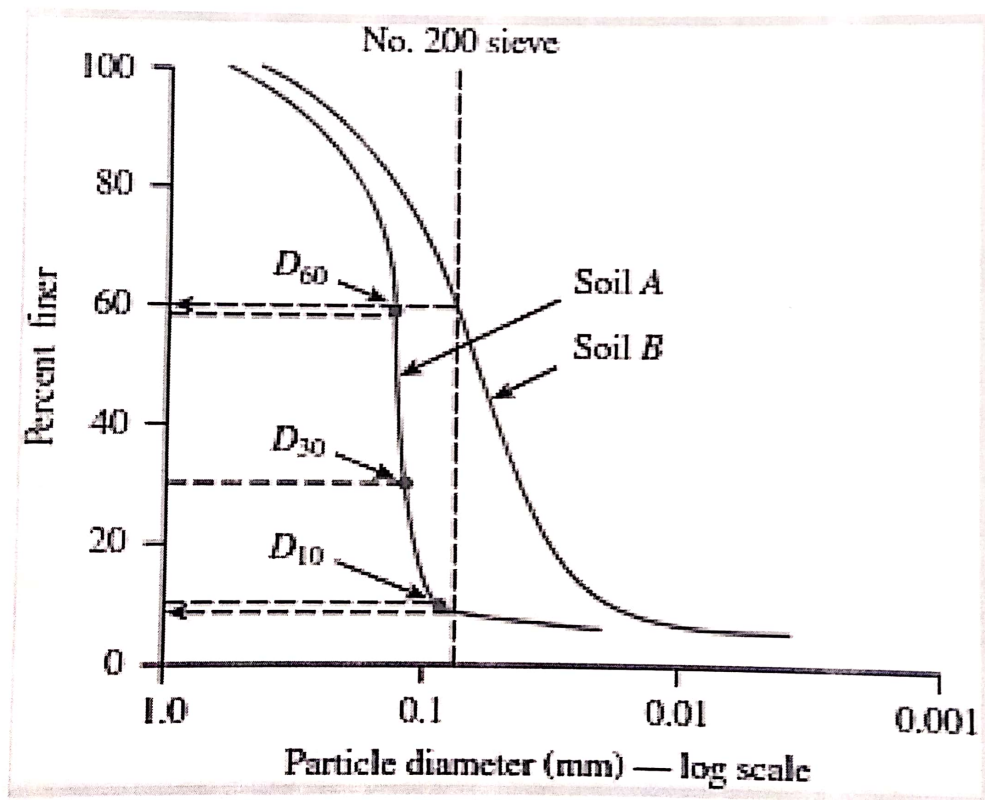
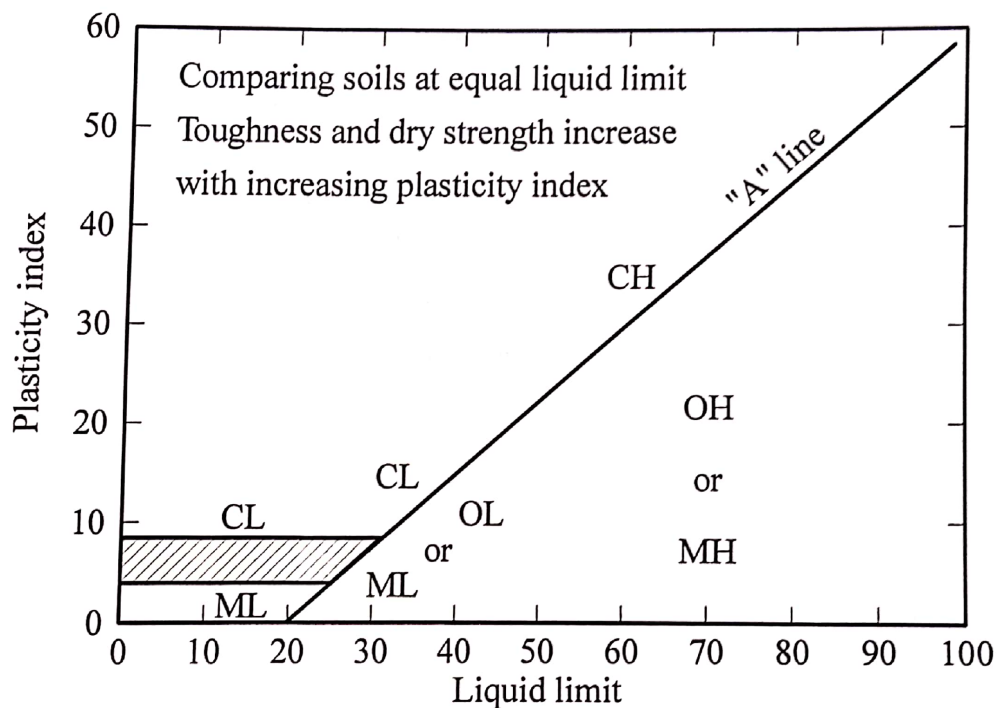


Figure 1: Soil grading curves

Question 2 (20 marks)

- a. Enumerate in chronological order taken in drawing good and accurate flow net. (4 marks)
- b. Given that the water levels at both upstream and downstream sides of Asejire dam were found to be 20 and 5m respectively. A flow net was drawn to be used to estimate the quantity of waste escaping underneath the dam every second. The number of potential drops and flow tube s were 5 and 5 respectively. The dam length or axis was measured to be 25m. Estimate the quantity that will escape every second underneath the dam assuming the underlying soil underneath the dam k is 10^{-5} m/sec. (8 marks)
- c. Soil Mechanics and Geotechnical Engineering are the same, True or False? Justify your answer.(8 marks)



Question 3 (20 marks)

- a. During soil practical work, a sample of soil was taken using a thin walled sampling tube into a soil deposit. After the soil was extruded from the sampling tube a sample of diameter 50 mm and length 80 mm was cut and was found to have a mass of 290 g. Soil trimmings created during the cutting process were weighed and found to have a mass of 55 g. These trimmings were then oven dried

and found to have a mass of 45 g. Determine the phase distributions, void ratio, degree of saturation and relevant unit weights. **(12 marks)**

- b. What are the reasons for compacting soil during road construction? and list factors affecting the process. **(4 marks)**
- c. State two reasons why flow of water in soils is very vital to Civil Engineers. **(4 marks)**

Question 4 (20 marks)

- a. Using well-elaborated sketch, explain the soil profile. **(10 marks)**
- b. Enumerate the importance of taking the course "soil mechanics" in your department. **(6 marks)**
- c. Mention two available methods available in your laboratory for determining soils' coefficient of conductivity and state their limitation. **(4 marks)**

Question 5 (20 marks)

- a. A uniform layer of sand 10 m deep overlays bedrock. The water table is located 2m below the surface of the sand which is found to have a void ratio $e = 0.7$. Assuming the soil particles have a specific gravity $G_s = 2.7$. Calculate the effective stress at a depth of 5m below the surface. **(6 marks)**
- b. Using well defined symbols, derive the relationship between soil porosity and void ratio. **(4 marks)**
- c. Explain the following types of soil and their location:
- i. Residual soil;
 - ii. Alluvial soil;
 - iii. Aeolian soils;
 - iv. Lacustrine soil;
 - v. Glacial soil;
 - vi. Coarse grained soil. **(10 marks)**

Question 6 (20 marks)

- a. Write short note on different types of weathering and mention their facilitators. **(8 marks)**
- b. What is soil compaction? Mention the major difference between soil compaction and soil consolidation. **(4 marks)**
- c. For a moist soil sample taken to laboratory. The following are given: the total volume $V = 1.2 \text{ m}^3$; total mass $M = 2350 \text{ kg}$; moisture content $w = 8.6 \%$ and specific gravity of soil solids, $G_s = 2.7$. Use the information provided, estimate soil moist density, dry density, void ratio, degree of saturation and volume of water in the sample. **(8 marks)**

Question 7 (20 marks)

- a. A constant head permeability test was conducted in the Laboratory. The soil data obtained were: specimen tube length $L = 30\text{cm}$, cross-sectional area of specimen $A = 177\text{cm}^2$, constant head difference $h = 50\text{cm}$. Water collected in a period of 5 minutes was 350cm^3 . Estimate the soil hydraulic conductivity. **(5 marks)**
- b. A soil has a void ratio of 0.65. Calculate the dry and saturated unit weights of the material. Assume that the soil occupies 1m^3 , specific gravity $G_s = 2.60$. Estimate soil dry unit weight, saturated unit weight and moisture content. **(9 marks)**
- c. Define the following terms: i. Liquidity index, ii. Plastic limit, iii. Liquid limit. **(6 marks)**