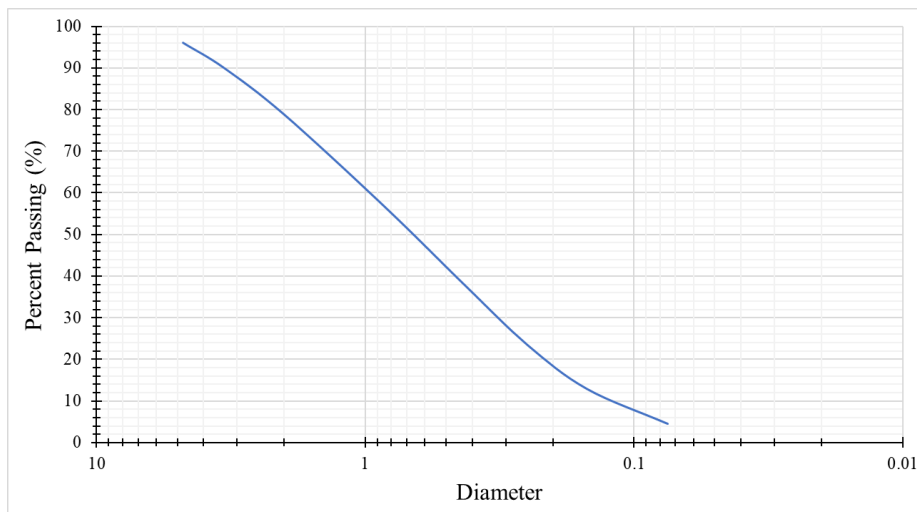


Birzeit University
Faculty of Engineering
Department of Civil and Environmental Engineering
ENCE 331, Soil Mechanics
First semester 2020-2021
Midterm Exam

Question 1: (25 Points)

Given the following Sieve Analysis and Atterberg limits results. Answer the following questions:

- 1- What is the effective diameter of this soil?
- 2- Calculate the uniformity coefficient and coefficient of gradation
- 3- Determine the percentage of Gravel, Sand, Fine soils according to USCS.
- 4- Classify the soil using AASHTO (with GI) & USCS (with group name).



Sieve #	Diameter (mm)	% Passing
4	4.75	96
6	3.35	90
10	2	78.8
20	0.85	56.8
40	0.425	37.8
60	0.25	23.6
100	0.15	13
200	0.075	4.6
Pan	0	0
LL	10	
PL	5	

Question 2: (25 Points)

1750 m³ of compacted fill is required to construct an earthen embankment. The contractor has two options get the soil from. Their in-situ properties are shown below. The soil is transported using 15m³ trucks. If the compacted fill is required to have the following specification.

$$\gamma_b = 18 \text{ kN/m}^3$$

$$w = 8\%$$

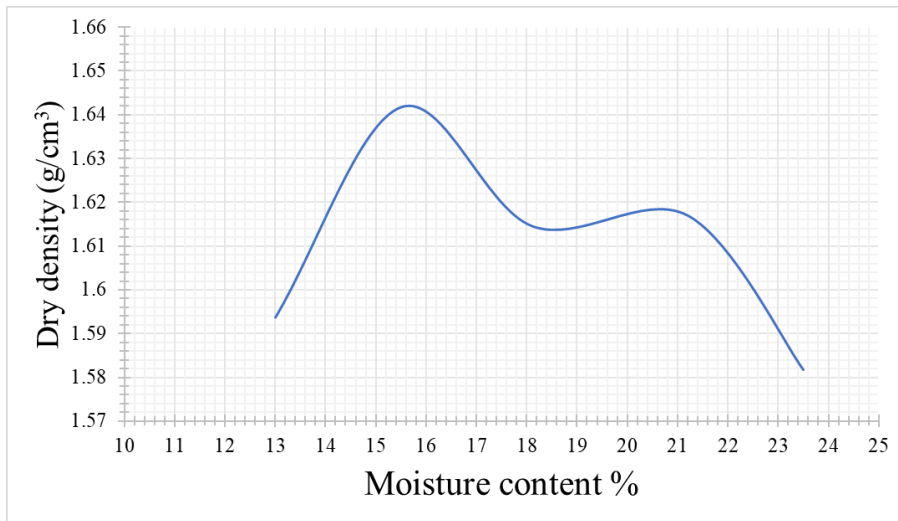
- Knowing that additional water cost 10 NIS/m³, Which option is the most economical?
- Find the following soil parameters for the compacted soil?
 - Void ratio, dry unit weight, degree of saturation, and porosity

	G_s	γ_a (kN/m ³)	w%	Cost (NIS/Truck)
Option 1	2.7	15	5	375
Option 2	2.7	13	7	300

Question 3: (15 Points)

Given the compactions curve for a soil sample shown below. Answer the following questions:

- What is the optimum moisture content to compact the soil?
- What is maximum dry density can be reached?
- What is the maximum bulk density can be reached?
- If project specification calls for minimum DOC of 97%, What is the acceptable range of field dry density?



W%	$\gamma_d(\text{G}/\text{CM}^3)$
13	1.594
15.5	1.642
18.1	1.615
21.2	1.617
23.5	1.582

Question 4: (35 Points)

A permeameter tube (square cross-section) is filled with layers of soil of different permeability as shown below.

- Find the equivalent permeability for the assembly of soils
- Find the **Total head, elevation head** and **pore water pressure** at points (A, B, and C) with respect to the given datum.

Given: $k_1=2k_2=3k_3=k_4 = 2 \times 10^3 \text{ cm/sec}$

All units are in cm

