Course No: CVL **3413**
Course Title: Soil Mechanics
Date: 28 / 7 /2013
No. of Questions: (4)
Time: 1.5 hr
Using Calculator (Yes)

University of Palestine

Mid-Term Exam
Third Semester
2012/2013
Total Grade: 40

Instructor Name: Dr. Sari Abusharar
Student No.: _____
Student Name: _____
College Name: Engineering
Dep. / Specialist: Civil Engineering
Using Dictionary (No)

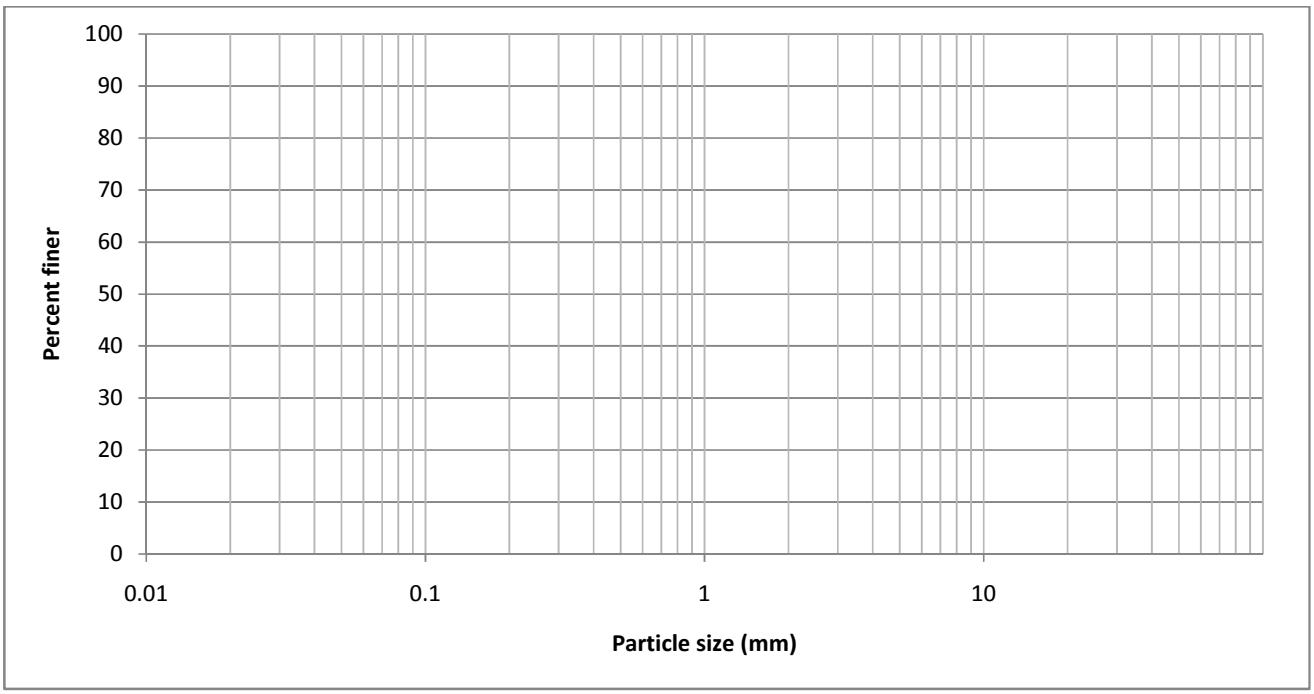
Answer All Questions

First Question 10/40

The following are the results of a sieve analysis:

U.S. sieve no.	Size (mm)	Mass of soil retained (g)			
10	2.00	0			
20	0.85	157.5			
40	0.425	135			
60	0.250	45			
80	0.180	31.5			
100	0.150	13.5			
200	0.075	45			
Pan	-	22.5			

a. Determine the percent finer than each sieve and plot a grain-size distribution curve.



b. Calculate the uniformity coefficient, C_u.

c. Calculate the coefficient of gradation, C_c.

Second Question	**10/40**

1. For the soil in problem one, LL=44, PL=26, classify the soil according to AASHTO classification system by giving group names and symbols.

2. A proposed embankment fill required a minimum relative compaction of 97%. The maximum dry unit weights and optimum moisture content of the fill were determined in the laboratory to be 19.20 kN/m^3 and 14.60 % respectively. The maximum dry unit weights and optimum moisture content of the fill were determined in the field to be 17.80 kN/m^3 and 17.30 % respectively.

   a. Explain whether or not you will approve the contractor's work.

   b. What can you advise the contractor to do if compaction does not meet the specifications?

Third Question **10/40**

The relative compaction of a soil in the field is 95%. The maximum and minimum dry unit weights of the soil are 105 lb/ft^3 and 95 lb/ft^3, respectively. The specific gravity of the soil is 2.70. For the field condition, determine

a. Dry unit weight

b. Relative density of compaction

c. Moist unit weight at a moisture content of 12%

d. Zero-air-void unit weight for the soil in lb/ft^3 at a moisture content of 12%

Fourth Question 10/40

The moist weight of 0.3 ft^3 of a soil is 35 lb. The moisture content and the specific gravity of the soil solids are determined in the laboratory to be 13% and 2.7, respectively. Calculate the following:

a. Moist unit weight

b. Dry unit weight

c. Void ratio

d. Porosity

e. Degree of saturation

Good luck

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Useful Formulae

$$\gamma_d = \frac{\gamma}{1 + w}$$

$$\gamma = \frac{(1 + w)G_s\gamma_w}{1 + e}$$

$$\gamma_{zav} = \frac{G_s\gamma_w}{1 + wG_s} = \frac{\gamma_w}{w + \frac{1}{G_s}}$$

$$C_u = \frac{D_{60}}{D_{10}}$$

$$C_c = \frac{D_{30}^2}{D_{60} \times D_{10}}$$

$$Se = wG_s$$

$$D_r = \left[\frac{\gamma_{d(\text{field})} - \gamma_{d(\min)}}{\gamma_{d(\max)} - \gamma_{d(\min)}}\right]\left[\frac{\gamma_{d(\max)}}{\gamma_{d(\text{field})}}\right]$$

$$D_r = \left[\frac{\rho_d - \rho_{d(\min)}}{\rho_{d(\max)} - \rho_{d(\min)}}\right]\frac{\rho_{d(\max)}}{\rho_d}$$

$$M_s = \frac{M}{1 + w}$$

$$n = \frac{e}{1 + e}$$

$$R(\%) = \frac{\gamma_{d(\text{field})}}{\gamma_{d(\max\text{—lab})}} \times 100$$

$$w = \frac{W_w}{W_s}$$

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Table 5.1 Classification of Highway Subgrade Materials

General classification	Granular materials (35% or less of total sample passing No. 200)						
	A-1			A-2			
Group classification	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7
Sieve analysis (percentage passing)							
No. 10	50 max.						
No. 40	30 max.	50 max.	51 min.				
No. 200	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.
Characteristics of fraction passing No. 40							
Liquid limit				40 max.	41 min.	40 max.	41 min.
Plasticity index	6 max.		NP	10 max.	10 max.	11 min.	11 min.
Usual types of significant constituent materials	Stone fragments, gravel, and sand		Fine sand	Silty or clayey gravel and sand			
General subgrade rating	Excellent to good						

General classification	Silt-clay materials (more than 35% of total sample passing No. 200)			
Group classification	A-4	A-5	A-6	A-7 A-7-5[a] A-7-6[b]
Sieve analysis (percentage passing)				
No. 10				
No. 40				
No. 200	36 min.	36 min.	36 min.	36 min.
Characteristics of fraction passing No. 40				
Liquid limit	40 max.	41 min.	40 max.	41 min.
Plasticity index	10 max.	10 max.	11 min.	11 min.
Usual types of significant constituent materials	Silty soils		Clayey soils	
General subgrade rating	Fair to poor			

[a] For A-7-5, $PI \leq LL - 30$
[b] For A-7-6, $PI > LL - 30$

$$GI = (F_{200} - 35)[0.2 + 0.005(LL - 40)] + 0.01(F_{200} - 15)(PI - 10)$$

$$GI = 0.01(F_{200} - 15)(PI - 10)$$