CVG 3109: SOIL MECHANICS – ASSIGNMENT # 1 (Fall, 2017)

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FUNDAMENTALS OF SOIL MECHANICS: BACKGROUND AND REVIEW

Q1. Classify the following soils using the Unified Soil Classification System (Based on ASTM-standards: Using Charts summarized in Class Notes) and provide the group symbols: (Draw the grain-size distribution curves on a semi-log sheet)

Soil	Sieve analysis, % finer				Liquid Limit	Plastic Limit
	No. 4	No. 10	No. 40	No. 200		
A	48	30	12	2	-	NP
B	95	90	67	52	60	29
C	100	100	78	14	25	17
D	100	85	68	45	38	12

Which one of these soils; A, B, C or D will have a higher coefficient of permeability. Give reasons.

Q2. For a moist soil, given that *Volume = 5600 cm^3*; *Mass = 10.2 kg*; Moisture content = *10%*; *Gs = 2.7*, calculate the following:

a. Bulk density (Mg/m^3)
b. Dry density (Mg/m^3)
c. Void ratio
d. Porosity
e. Degree of saturation (%)
f. Volume occupied by water (cm^3)

Q3. Following are the results related to liquid and plastic limit tests for a soil:

Number of Blows	Moisture Content (%)
13	33
18	27
29	22

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Plastic Limit = 11%

a. Draw the flow curve and obtain the liquid limit.
b. What is the plasticity index of the soil?
c. Determine the liquidity index of the soil when the *in-situ* moisture content is *15%*.
d. What do you derive from the liquidity index value? How is it useful from an engineering practice point of view?
e. Draw typical flow curves for a sand, silt and clay (on the same figure)? (show only the shapes).

Q4. Prove that:

$$\frac{e_{max} - e}{e_{max} - e_{min}} = \frac{\gamma_{d\,max}}{\gamma_d} * \frac{\gamma_d - \gamma_{d\,min}}{\gamma_{d\,max} - \gamma_{d\,min}}$$

where e_{min} = void ratio of soil in densest condition, e_{max} = void ratio of soil in loosest condition, e = in-place void ratio, $\gamma_{d\,max}$ = dry unit weight of soil in densest condition, $\gamma_{d\,min}$ = dry unit weight of soil in loosest condition, and γ_d = in-place dry unit.

Q5. The following results were obtained from a standard compaction test on a soil:

Mass (g)	*1805*	*1890*	*1985*	*1917*	*1860*
Water Content (%)	12	13	14.7	17	19.3

The value G_s is *2.65*. Plot the *dry unit weight (*kN/m³*) – water content (%)* and give the optimum water content and maximum dry unit weight. Plot also the zero-air-voids (ZAV) line (*S =100%*), *S = 90%* and *S = 50%* curves. The volume of the mold is *944*cm³.

Date of submission: 27th September, 2017 (Please drop your Assignment in the drop-box in CBY AO floor (which is adjacent to CBY A019 room). Use a cover page on your Assignment, which is available in Assignments folder of the Brightspace website.

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