

**Carleton University**  
**CIVE 3208 (EART 4107): Geotechnical Mechanics**

**Assignment #1**

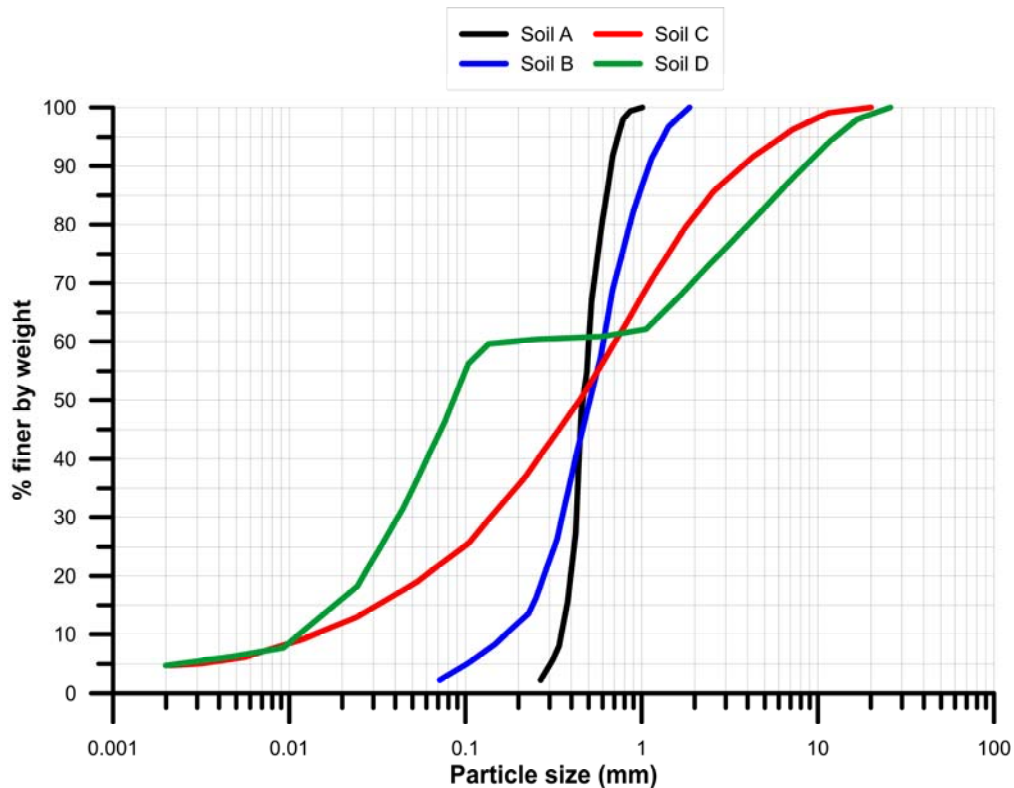
**Tutorial: Oct. 15, HS 1301, 1:00-2:30 PM**

**Due: October 17**

1. The following results were obtained from sieve analyses and Atterberg limits of three soils – A, B and C. Classify each of these soils according to the USCS. (15 marks)

Sieve No	Soil A (mass retained, g.)	Soil B (mass retained, g.)	Soil C (mass retained, g.)
4	0	0	0
10	20.2	48.2	15
20	25.7	19.6	98
40	40.4	60.3	90
100	18.1	37.2	182
200	27.2	22.1	109
Pan	68.2		6
LL	23%	Non-plastic	Non-plastic
PL	8%		

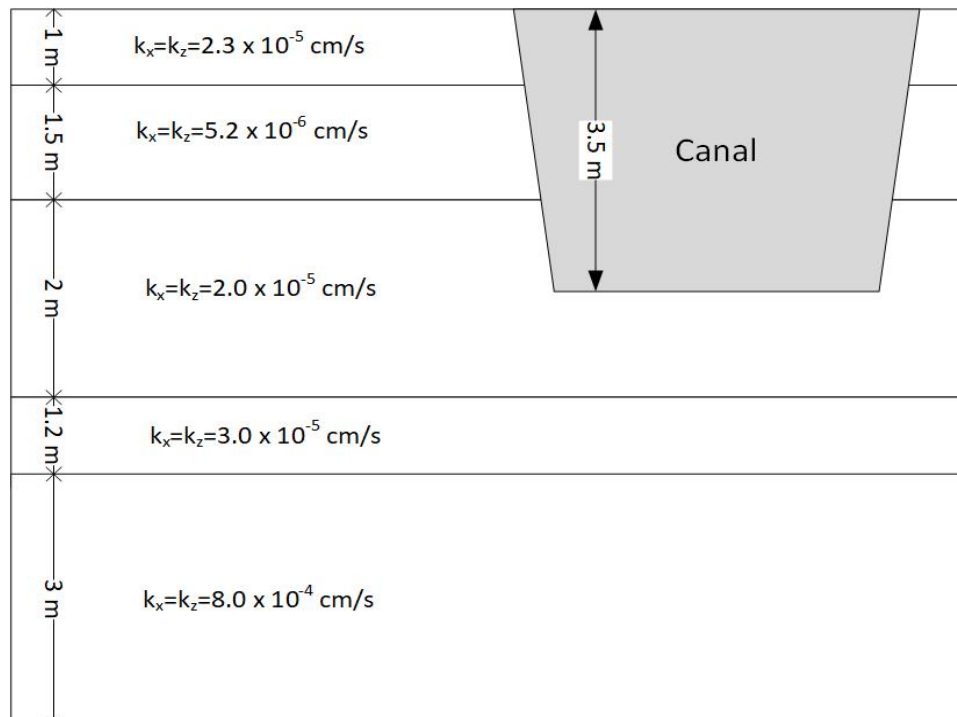
2. For the given particle-size distribution curves, classify each soil based on Unified Classification System. (10 marks)



3. In its natural condition a soil sample has a mass of 2290 g and a volume of  $1.15 \times 10^{-3} \text{ m}^3$ . After being completely dried in an oven the mass of this sample is 2035 g. The value of  $G_s$  for the soil is 2.65. Determine the bulk density, bulk unit weight, water content, void ratio, porosity, and degree of saturation. (10 marks)
4. Prove the following equations: (10 marks)
- $$\gamma_d = \frac{G_s \gamma_w}{1 + e}$$
- $$S = \frac{w G_s (1 - n)}{n}$$
5. A soil has been compacted in an embankment at a bulk density of  $2.15 \text{ Mg/m}^3$  and a water content of 12%. The value of  $G_s$  is 2.65.
- Calculate dry density, void ratio and degree of saturation. (10 marks)
  - Would it be possible to compact the above soil at a water content of 13% to dry density of  $2.0 \text{ Mg/m}^3$ ? (5 marks)
6. If a granular soil is compacted to a bulk unit weight of  $20.45 \text{ kN/m}^3$  at a moisture content of 18%, what is the relative density of the compacted soil, given  $e_{\max} = 0.85$ ,  $e_{\min} = 0.42$ , and  $G_s = 2.65$ ? (5 marks)

What is the relative compaction? (5 marks)

7. A canal is cut into a soil with a stratigraphy shown in the figure. Calculate the ratio of the equivalent horizontal hydraulic conductivity to the equivalent vertical hydraulic conductivity for **flow through the sides of the canal**. (15 marks)



8. Determine the quantity of seepage under the dam and plot the distribution of uplift pressure at points A to D. The coefficient of permeability of the foundation soil is  $2.5 \times 10^{-5}$  m/s. (15 marks)

