Due 17/03, Monday, 17:00
To be dropped into the homework box inside the laboratory.

CE 363-364 Homework-1

State all assumptions clearly. For all questions, you may take ρ_w=1 g/cc, g=10 m/s^2.

1) A moist soil sample has a volume of 22.3 cm^3 and weighs 39.7 g. The dry weight of the sample was determined to be 33 g. The value of G_s is 2.65. Determine:
    a) Void ratio
    b) Water content
    c) Porosity
    d) Degree of saturation of the sample
    e) What would be the total unit weight and water content if the soil were fully saturated at the same void ratio in its natural state?

2) A sand has a minimum void ratio of 0.48, a maximum void ratio of 0.81, and specific gravity of its solids is 2.6. A 2m thick layer of this sand is at a relative density of 65%. compacted at 12% water content, and 12 cm settlement was observed at the end of compaction. Assume that the sand layer is compressed in the vertical direction only, with no lateral strain. Calculate the relative density, bulk density, dry density and air content of the sand after compaction.

3) The results of particle size analysis and, where appropriate, Atterberg limit tests on samples of four soils are given in the table below.

Particle size (mm)	Percentage smaller (%)			
	Soil A	Soil B	Soil C	Soil D
19	100	-	-	-
6.35	94	100	-	-
2	69	98	-	-
0.59	32	88	100	-
0.21	13	67	95	100
0.074	2	37	73	99
0.020	-	22	46	88
0.006	-	11	25	71
0.002	-	4	13	58

Liquid limit (%)	-	Non-plastic	32	78
Plastic limit (%)	-		24	31

    a) Plot the grain size distribution curve of each soil (use Excel or graphing softwares)
    b) Determine the percentages of gravel, sand and the fines in samples A and B.
    c) Determine $D_{10,}$ $D_{30,}$ D_{60}, C_U and C_Z of soils A and B, and comment on their gradation.
    d) Classify each soil according to Unified Soil Classification System, write both 2-letter abbreviated form and the open form.
    e) For soil D, if the natural water content is 55%, what is the consistency in its natural state. Determine also the plasticity index and liquidity index of soil D.