METU Civil Engineering Department
CE363 Soil Mechanics
2011-2012 Fall Semester

HOMEWORK 5

Due on: Dec 20 Tuesday, 17:00.

1) The following results were obtained at failure in a series of **consolidated drained** triaxial tests on fully saturated clay specimens originally 38 mm diameter and 76 mm long.

Test Number	1	2	3
Cell pressure (kPa)	200	400	600
Axial load at failure **(N)**	480	895	1300
Axial compression at failure (mm)	7.22	8.36	9.41
Volume Change at failure **(ml)**	5.25	7.4	9.3

   a) Calculate deviatoric stress in each test, plot Mohr circles and Mohr-Coulomb failure envelope (to scale), and determine the drained shear strength parameters c' and ϕ' **both graphically (measuring from your scaled drawing) and analytically (by calculations).**
   b) Each plane is represented by a point on a Mohr circle. What is the value of the effective normal and shear stresses acting on the failure plane in test no.1? What angle would the failure plane make with the major principal plane in the Mohr circle, and in the soil specimen.
   c) Plot the modified Mohr-Coulomb failure envelope and determine a', α' and determine drained shear strength parameters, c' and ϕ'.
   d) If we carried out a **consolidated undrained** triaxial test with pore pressure measurement, on a specimen taken from the same clay (same c' , ϕ'), what would be the pore pressure we would measure at failure in a specimen that is consolidated under an equal all around pressure of 240 kPa and failed at a deviatoric stress of 277 kPa.

2) A retaining wall is to be constructed in a clayey sand deposit as shown in the figure below. Ground water table is 1 m below the bottom of the excavation. A 10 kN/m^2 surcharge pressure is applied over a wide area at the ground surface.
   a) Calculate and sketch the active and passive earth pressure distributions, using Rankine earth pressure theory.
   b) Find the **total active thrust** (resultant force) and the **total passive resistance** (resultant force) acting on the wall, per m length of the wall into the page.