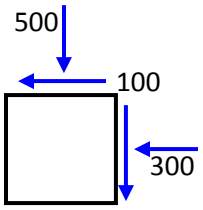
Due 12 May , Monday, 17:00

Spring'14 Soil Mechanics Homework-5

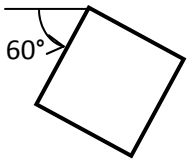
State all assumptions clearly.

Q1. For the given stress condition (σ_x=300kPa, σ_z=500kPa and τ=100 kPa):



a) Find principal stresses and their orientation (Hint: Use Mohr's circle)

b) Calculate stresses on planes that make an angle of 60°, to the CCW direction, with the x-z axes.



Q2.

a) Following results are obtained in a series of CU triaxial tests on saturated samples of a clay. Calculate the effective shear strength parameters (c' and ϕ') and plotting the Mohr-Coulomb failure envelope.

Test number	1	2	3
Confining Pressure (kPa)	40	80	120
Deviator stress (kPa)	110	190	240
Pore water pressure at failure (kPa)	20	15	35

b) Vane shear test is used to determine the undrained shear strength of the same clay in Part (a). The shear vane used in the test has a diameter of 60 mm and length of 140 mm. The average torque recorded in the undisturbed state is found to be 65 kN.m Calculate the undrained shear strength of the clay.

Q3.

a) A sand sample was hydrostatically consolidated under 420 kPa in a triaxial test device. Then it was sheared with the drainage valves open. At failure, (σ_1-σ_3) was 1046 kPa. Determine the principle stresses at failure and the angle of shearing resistance (i.e. friction angle) of the soil.

b) The same sand was also tested in a direct shear apparatus under a normal pressure of 420 kPa. The sample failed when a shear stress of 280 kPa was reached. Determine the principle stresses at failure and the angle of shearing resistance (i.e. friction angle) of the soil.

c) Draw mohr diagrams for both (a) and (b) within one graph, and compare the results found for (a) and (b).