53:030 SOIL MECHANICS

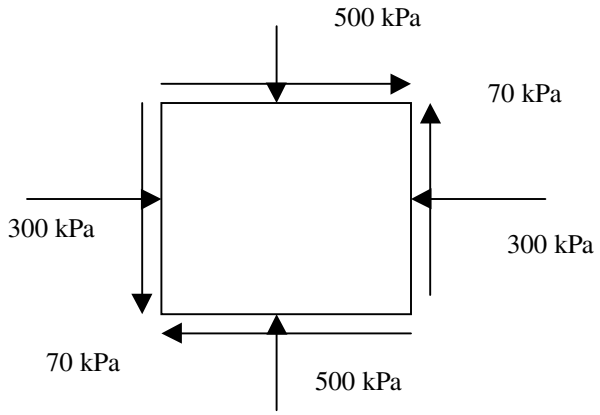
Civil & Environmental Engineering

The University of Iowa

FALL SEMESTER, 2001

Homework Assignment # 10 **Due Friday, 30 November 2001.**

1) At a region in a soil deposit, the stresses are as shown below. Use the pole method to answer the questions below.
   a) Plot the Mohr's circle associated with the stress state shown;
   b) Locate the pole P on the Mohr's circle.
   c) Find the stresses on a plane making an angle of 45^o counter-clockwise with the horizontal.
   d) Find the orientation of the major principal plane.
   e) Find the orientation of the minor principal plane.
   f) Find the orientation of the planes having maximum absolute shear stresses.



2) The initial principal stresses at a certain depth in a clay soil are 200 kPa on the horizontal plane and 100 kPa on the vertical plane. Construction of a surface foundation induces additional stresses consisting of vertical stress of 45 kPa, a lateral stress of 20 kPa, a positive shear stress on the horizontal plane of 40 kPa, and a negative shear stress on the vertical plane of 40 kPa.
   a) Plot the Mohr's circle for the initial state of stress;
   b) Plot the Mohr's circle for the state of stress after construction;
   c) Find the change in magnitude of principal stresses associated with the foundation loads;
   d) Find the change in maximum shear stresses from the foundation loads;

e) Find the change in orientation of the principal planes due to the foundation loading; and
f) Find the change in orientation of the planes of maximum and minimum shear.

3) If the maximum and minimum principal stresses at a point are identical, what is the maximum shear stress at that point?