King Saud University
College of Engineering
Department of Civil Engineering

CE 480 Soil Mechanics
Assignment # 5

Problem # 1

Given the following cases:

a) $\sigma_x = -20\ kN/m^2$ $\sigma_y = 100\ kN/m^2$
$\tau_{xy} = 35\ kN/m^2$ $\tau_{yx} = -35\ kN/m^2$

b) $\sigma_x = 10\ kN/m^2$ $\sigma_y = 50\ kN/m^2$
$\tau_{xy} = -20\ kN/m^2$ $\tau_{yx} = 20\ kN/m^2$

c) $\sigma_x = 20\ kN/m^2$ $\sigma_y = 0\ kN/m^2$
$\tau_{xy} = 30\ kN/m^2$ $\tau_{yx} = -30\ kN/m^2$

Using both the equations derived in class, and the Mohr's circle and pole method, determine:

i) The major and minor principal stresses and the planes on which they act.
ii) The maximum shear stress and the inclination of the plane on which it acts.
iii) For case (a), determine the normal and shear stresses on a plane inclined at 30° from the horizontal.

Problem # 2

The state of plane stress in a body is described by the following stresses:

$\sigma_1 = 9000\ kN/m^2$ compression
$\sigma_3 = 2000\ kN/m^2$ tension.

Determine by means of the Mohr's circle the normal stress and shear stress on a plane inclined at 10° to the plane on which the minor principal stress acts. Check the results analytically.