Short Answer Questions

1. What is the shear strength of soil, and why is it important in geotechnical engineering?

2. What are the three main types of shear tests used in the laboratory? Briefly describe them?

3. Compare the behavior of dense sand and loose sand under shear loading?

Calculation Problems

Problem 1

The normal stress and shear stress act on x-plane and z-plane are as Figure 1 shows. And $\sigma_{xx} = 50$ kPa, $\sigma_{xz} = -12.5$ kPa, $\sigma_{zz} = 25$ kPa, $\theta = 20°$. Determine the normal stress σ_θ and shear stress τ_θ on the plane, which is clockwise from the horizontal plane.

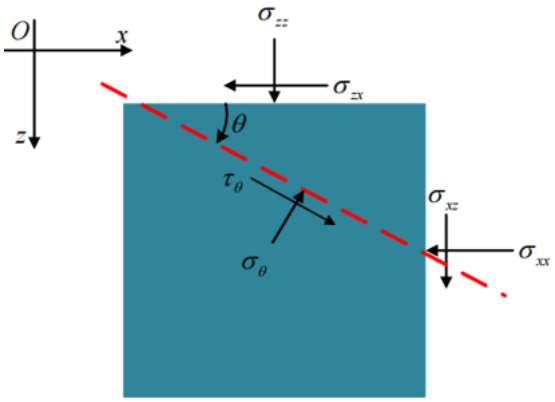

Figure 1: Stress distribution on planes

Problem 2

The major principal stresses at certain point within a cohesionless soil mass is $\sigma_1 = 300$ kPa. The shear strength parameters $\varphi = 20°$. Determine the minor principal stresses at failure.

Problem 3

In a CU test, the confining pressure on a specimen of saturated clay is 150 kPa, the ultimate principal stress difference is 260 kPa and the ultimate pore pressure is 50 kPa. Determine the Biot coefficients A and B.