Shear Strength: CU and CD Triaxial Tests

Q1. Consolidated undrained (CU) triaxial tests were performed on two specimens of overconsolidated clay at different consolidation stresses and the following results were obtained:

	Specimen I	Specimen II
Consolidation Stress, σ_3	150 kPa	300 kPa
Maximum Principal Stress Difference, $(\sigma_1-\sigma_3)_{max}$	197 kPa	295 kPa
Excess pore water pressure at failure, Δu_f	78 kPa	121 kPa

Plot the total and effective Mohr's circles at failure for both specimens and determine:

a) the total shear strength parameters, c_T and φ_T;

b) the effective shear strength parameters, and c′ and φ′

c) Describe the steps in the graphical solution for a) and b).

Q2. For a normally consolidated clay, it was found that $\varphi_T = 16°$ and $\varphi' = 28°$. If a similar specimen is sheared with $\sigma_3 = 120$ kPa in consolidated undrained (CU) test with pore water pressure measurements:

a) Plot the effective and total stress Mohr circles for the failure condition;

b) Estimate the principal stress difference at failure, $(\sigma_1 - \sigma_3)_f$, and the induced excess pore water pressure at failure, Δu_f

c) Describe the steps in the graphical solution for a) and b).