CE 443 Final

Name _____

For each problem work with the units given.

1. An 8m thick layer of fine sand overlies a 6m thick layer of normally consolidated clay. Water table is at 1m above the ground surface. Unit weight of saturated sand is 20.1 kN/m^3. Unit weight of saturated clay is 18.9 kN/m^3, its LL = 58 and PL = 21. Estimate undrained shear strength (c_u) of the clay at a depth of 12m below the ground surface (20)

2. A mat foundation is shown in Figure 11.31. (p441). The design considerations are L = 80', B = 60', D_f = 8', Q = 20,000 tons, x_1 = 4' (location of WT), x_2 = 0', x_3 = 12'. γ_{sand} = 122.4 lb/ft^3. For the clay γ = 106 lb/ft^3, e_0 = 0.95, C_c = 0.25, C_s = 0.08, and p_c = 1.25 t/ft^2'. Calculate the consolidation settlement in the middle of the mat. Assume that $\Delta p_{av} = \Delta p_m$.(30)

3. Timber piles are driven in sand with $N_{avg.}$ = 20 in the upper 22' and $N_{avg.}$ = 26 below it. Pile length = 25', butt diameter = 18", and tip diameter = 10". Determine ultimate point resistance and skin resistance of the pile. Use Meyerhof's method. (20)

4. Refer to Fig 12.30 page 490.

Dimensions: x_1 = 1'-6" x_2 = 1'-6" x_3 = 4' x_4 = 9'- x_5 = 3' D = 4'-6" H = 22' α = 15°

Material properties: γ_{water} = 62.4 lb/ft^3 $\gamma_{concrete}$ = 150 lb/ft^3

soil 1: γ_1 = 112 lb/ft^3 ϕ_1 = 32°

soil 2: γ_2 = 105 lb/ft^3f ϕ_2 = 22° c_2 = 200 psf

angle of base friction = 18° base adhesion = 0.75 c_2

Assume that soil 1 is used as backfill and is placed in front of the toe as well. Rankine condition prevails and passive resistance can be counted upon.

a. Show distribution of active pressure and passive resistance for the depth.(10)
b. Determine factor of safety with respect to overturning (10)
c. Determine factor of safety with respect to sliding (8)