Soil Mechanics
HW10

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Problem ①: $S_E = z\frac{B(1-M_s^2)}{E_s}$ If

$$25*10^{-3} = \frac{600*B*(1-0.3)^2*0.65}{B^2 * 20600}$$

$$\longrightarrow B = 0.689\,m$$

$$B*B = (0.689*0.689) = 0.475\,m^2$$

Problem ②: ① Attach with The Excel Sheet

② $\sigma_c' = 170\ KN/m^2$ using Casagrande's method

③ $$C_c = \frac{e_1 - e_2}{\log\frac{\sigma_1}{\sigma_2}} = \frac{0.755-0.65}{\log\left(\frac{1600}{800}\right)}$$

$$= 0.35$$

$$C_s = \frac{0.658-0.65}{\log\left(\frac{1600}{800}\right)} = 0.026$$

$$\frac{C_s}{C_c} = 0.074$$

Problem (3): (a) $\Delta\sigma' = \frac{P}{BL} = \frac{350}{(2.5)^2} = 56\ KN/m^2$

$\sigma_o' = (\gamma_{d(sand)}\ Df) + (\gamma_{sat(sand)} - \gamma_w)(H + Df) + (\gamma_{sat(clay)} - \gamma_w)\left(\frac{H_2}{2}\right)$

$= (16.4 * 2) + (18.8 - 9.81)(3-2) + (17.6 - 9.81)\left(\frac{4.5}{2}\right)$

$= 59.32\ KN/m^2$

$$S_c = \frac{C_c\ H}{1+e_o}\left[\frac{\sigma_o' + \Delta\sigma'}{\sigma_o'}\right]$$

$$= \frac{0.35\ (4.5)}{1+0.82}\log\left[\frac{59.32 + 56}{59.32}\right]$$

$= 0.25$

(b) $C_c = \frac{\Delta e}{\log\left[\frac{\sigma_o' + \Delta\sigma'}{\sigma_o'}\right]}$

$0.35 = \frac{\Delta e}{0.289}$

$\rightarrow e_f = 0.10115 + e_o$

$\rightarrow e_f = 0.92115$

(c) $S_c = \frac{0.02}{1+87} * 4.5 \log\left(\frac{6}{25}\right) = 0.02$