

Soil Mechanics

HW10

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

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

$$\rightarrow B = 0.689 \text{ m}$$

$$B * B = (0.689 * 0.689) = 0.475 \text{ m}^2$$

Problem ②: ① Attach with The Excel Sheet

② $c_c' = 170 \text{ KN/m}^2$ using Casagrande's method

③
$$C_c = \frac{e_1 - e_2}{\log \frac{6_1}{6_2}} = \frac{0.755 - 0.65}{\log \left(\frac{1600}{800} \right)}$$
$$= 0.35$$

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

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

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

$$\begin{aligned} \sigma'_0 &= (\gamma_d(\text{sand}) D_f) + (\gamma_{\text{sat}}(\text{sand}) - \gamma_w)(H + D_f) + (\gamma_{\text{sat}}(\text{clay}) - \gamma_w)\left(\frac{H_2}{2}\right) \\ &= (16.4 * 2) + (18.8 - 9.81)(3 - 2) + (17.6 - 9.81)\left(\frac{4.5}{2}\right) \\ &= 59.32 \text{ kN/m}^2 \end{aligned}$$

$$\begin{aligned} S_c &= \frac{C_c H}{1 + e_0} \left[\frac{\sigma'_0 + \Delta \sigma'}{\sigma'_0} \right] \\ &= \frac{0.35 (4.5)}{1 + 0.82} \log \left[\frac{59.32 + 56}{59.32} \right] \\ &= ~~0.289~~ 0.25 \end{aligned}$$

b) $C_c = \frac{\Delta e}{\log \left[\frac{\sigma'_0 + \Delta \sigma'}{\sigma'_0} \right]}$

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

$$\rightarrow e_f = 0.10115 + e_0$$

$$\rightarrow e_f = 0.92115$$

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