Soil Mechanics

HW #7

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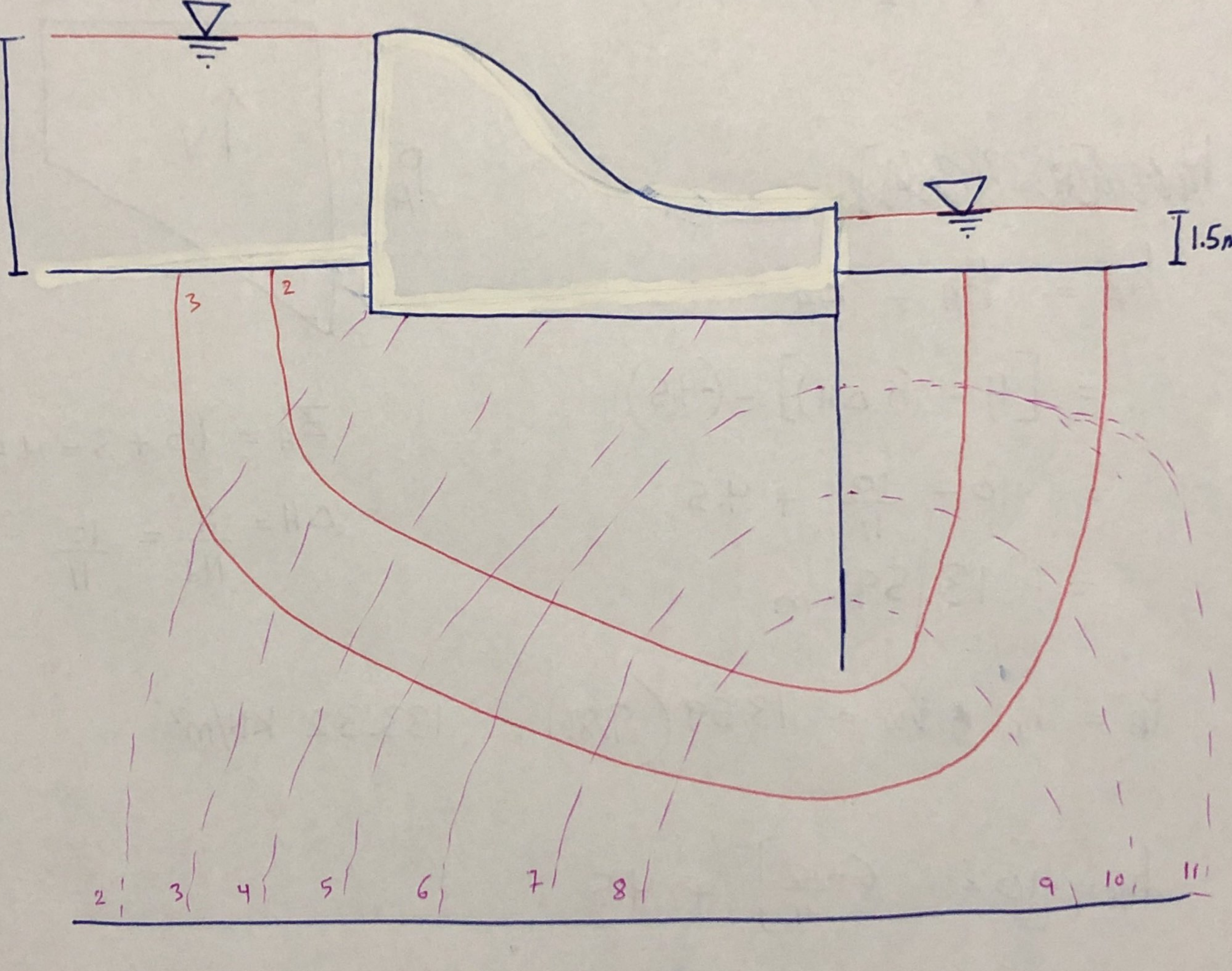
Problem ①: ① $L = 50\ m$, $K = 10^{-3}\ cm/sec$



$N_f = 3$

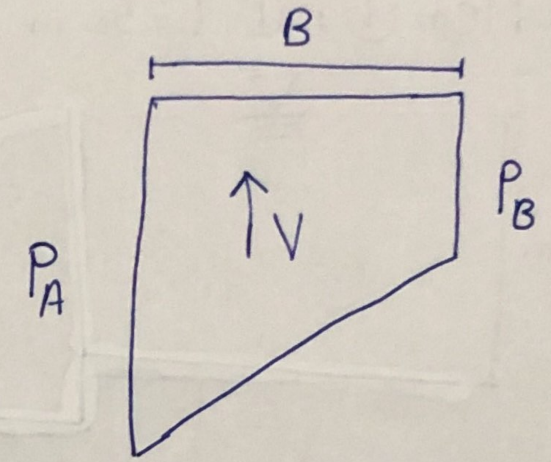
$N_D = 11$

② $\Delta H = 10 - 1.5 = 8.5 \text{ m}$

$$q = \left(K \, \Delta H \, \frac{N_f}{N_D}\right) * L = \frac{10^{-3}}{100}(8.5)\left(\frac{3}{11}\right)(50)$$

$$= 1.159 * 10^{-3} \text{ m}^3/\text{sec}$$

③ $V = \left(\frac{P_A + P_B}{2}\right)(B)(L)$



[illegible]

$$h_A = H_A - Z_A$$

$$= [H - (n \, \Delta H)] - (-4.5)$$

$$= 10 - \frac{10}{11} + 4.5$$

$$= 13.59 \text{ m}$$

$Z_A = 1.5 + 3 = 4.5 \text{ m}$

$\Delta H = \frac{H}{N_d} = \frac{10}{11}$

$$P_A = h_A * \gamma_w = 13.59(9.81) = 133.32 \text{ kN/m}^2$$

$$h_B = \left[10 - \frac{6 * 10}{11}\right] + 4.5$$

$$= 9.05 \text{ m}$$

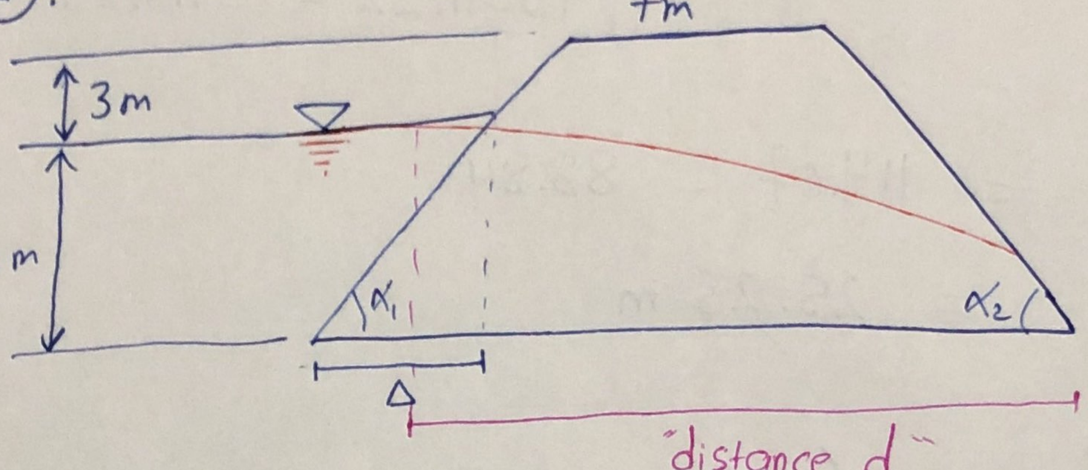
$$P_B = h_B * \gamma_w = 88.78 \text{ kN/m}^2$$

$$V = \frac{(133.32 + 88.78)}{2}(37)(50) = 205442.5 \text{ kN}$$

④ $i_{ex} = \frac{\Delta H}{\Delta L} = \left(\frac{10}{11}\right)/3$

$\rightarrow i_{ex} = 0.303$

Problem ②:



$\alpha_1 = \alpha_2 = \alpha$

* $\tan\alpha = \frac{1}{2} \rightarrow \alpha = 26.57°$

* $\Delta = \frac{32}{\tan(26.57°)} = 64$ m

* $d = \frac{35}{\tan(26.57°)} + 7 + \frac{(35-32)}{\tan(26.57°)} + 0.3(64)$

$= 102.02$ m

* $a = \frac{d}{\cos\alpha} - \sqrt{\frac{d^2}{\cos^2\alpha} - \frac{H^2}{\sin^2\alpha}}$

$= \frac{102.02}{\cos 26.57°} - \sqrt{\frac{(102.02)^2}{(\cos 26.57°)^2} - \frac{(32)^2}{(\sin 26.57°)^2}}$

$= 114.07 - \sqrt{13011.22 - 5118.23}$

$= 114.07 - 88.84$

$= 25.23$ m

* $q = Ka (\sin 26.57°)(\tan 26.57°)$

$= 10^{-5} (25.23)(0.224)$ Schaffernak's sol.

$= 5.65 * 10^{-5}$ m²/sec $= 0.2034$ m²/min

* Casagrande's sol :-

$q = K a \sin^2\alpha$

* $a = \sqrt{H^2 + d^2} - \sqrt{d^2 - H^2 \cot^2\alpha} = 106.92 - 79.45$

→ $a = 27.47$ m

→ $q = 10^{-5} (27.47)(\sin 26.57°)^2 = 5.50 * 10^{-5}$ m²/sec

$= 0.198$ m²/min