Faculty of Engineering and Technology

Civil engineering department

SOIL MECHANICS

ENCE331

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Assignment #2

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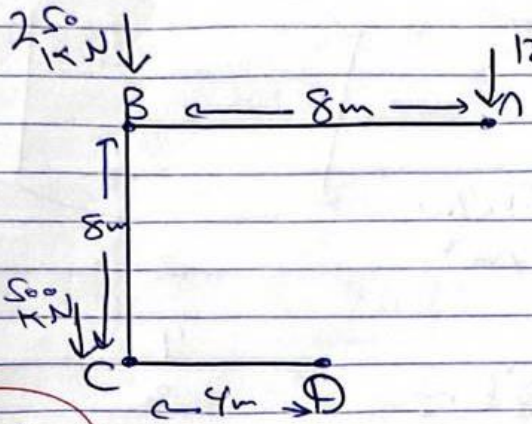
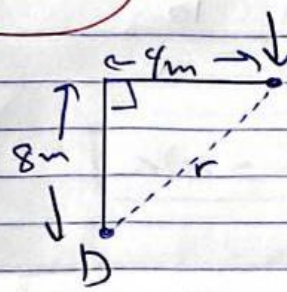
خيري ابوطير 1200945

* السؤال الأول:



Z = 10m

1) at A



$r = \sqrt{4^2 + 8^2} = \boxed{8.94\,m}$

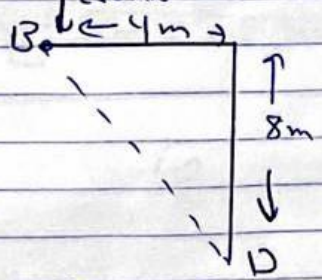
$r \approx 9m$

$\frac{r}{Z} = \frac{9}{10} = 0.9$

$I_1 = 0.1083$ (Table 10.1)

$\Delta\sigma_1 = \frac{P_1}{Z^2} I_1 \Rightarrow \frac{125}{(10)^2} * 0.1083 = \boxed{0.135\ KN/m^2}$

2) at B



$r = \sqrt{4^2 + 8^2} = 8.9 \approx 9m$

$\frac{r}{Z} = \frac{9}{10} = 0.9$

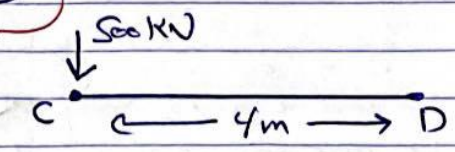
$I_2 = 0.1083$ (Table 10.1)

$\Delta\sigma_2 = \frac{P_2}{Z^2} I_2 \Rightarrow \frac{250}{100}(0.1083)$

$\boxed{\Delta\sigma_2 = 0.271\ KN/m^2}$

* تكملة السؤال الأول:

3) at C



$r = \sqrt{(0)^2 + 4^2} = 4m$

$\frac{r}{z} = \frac{4}{10} = 0.4 \Rightarrow I_3 = 0.3294$ (table 10.1)

$\Delta\sigma_3 = \frac{P_3}{z^2} I_3 = \frac{500}{100}(0.3294)$

$\Delta\sigma_3 = 1.647\ KN/m^2$

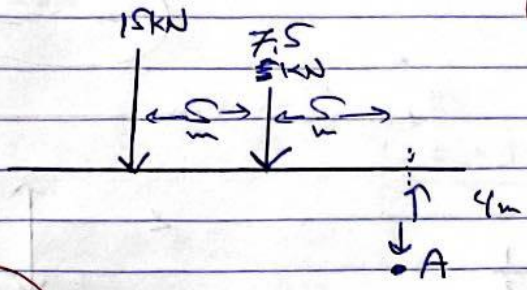
total stress at D =>

$\Delta\sigma_{total} = \sigma_1 + \sigma_2 + \sigma_3$

$= 1.647 + 0.271 + 0.135$

$\Delta\sigma_{tot} = 2.05\ KN/m^2$

السؤال الثاني :-



(1 15KN →

$\frac{x}{z} = \frac{10}{4} = 2.5 \rightarrow \frac{\Delta\sigma}{(q/z)} = 0.0125$ (table 10.2)

$0.0125 * \frac{15}{4} = 0.0468$

(2 7.5KN →

$\frac{x}{z} = \frac{5}{4} = 1.25 \rightarrow \frac{\Delta\sigma}{(q/z)} = 0.0975$ (table 10.2)

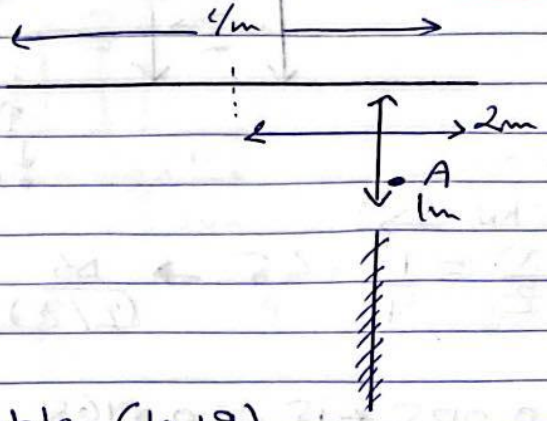
$0.0975 * \frac{7.5}{4} = 0.183$

total stress acting on A is $0.183 + 0.0125 = 0.195\ KN/m^2$

$\approx 0.2\ KN/m^2$

السؤال الثالث:-

B: 4m
q: 100 KN/m²
z: 1m
x: 1m



$\frac{2x}{B} = \frac{2(1)}{4} = \frac{1}{2}$

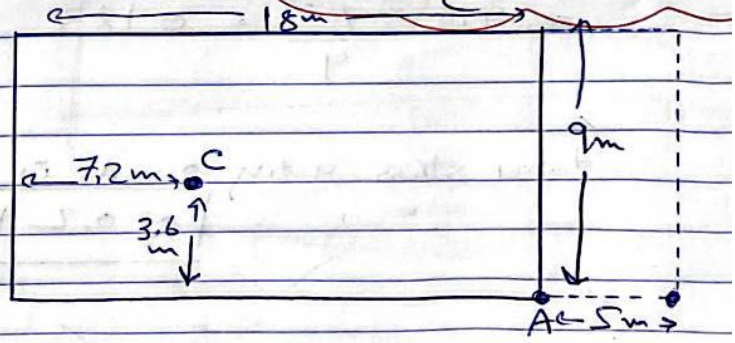
$\frac{2z}{B} = \frac{2(1)}{4} = \frac{1}{2}$

$\frac{\Delta\sigma}{q}$ = 0.902 from table (10.19)

$\Delta\sigma = 0.902 * 100 = \boxed{90.2\ KN/m^2}$

السؤال الرابع:-

q = 330 KN/m²
z = 6m



1) at A:-

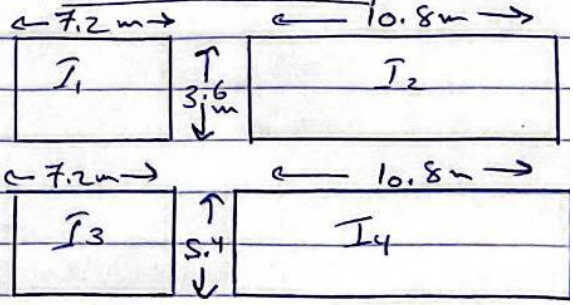
$m = \frac{B}{z} = \frac{9}{6} = 1.5$

$n = \frac{L}{z} = \frac{18}{6} = 3$ table (10.10)

$\Delta\sigma = qI = 0.2275 * 330 = 75.07 \approx \boxed{75.2\ KN/m^2}$

2) at C:-

$\Delta\sigma = q(I_1 + I_2 + I_3 + I_4)$



تكملة السؤال الرابع :-

(table 10.10)

$I_1 \rightarrow m_1 = \frac{3.6}{6} = 0.6$

$n_1 = \frac{7.2}{6} = 1.2$ $\quad \boxed{I_1 = 0.1431}$

$I_2 \rightarrow m_2 = \frac{3.6}{6} = 0.6$

$n_1 = \frac{10.8}{6} = 1.8$ $\quad \boxed{I_2 = 0.1521}$

$I_3 \rightarrow m_3 = \frac{5.4}{6} = 0.9$

$n_1 = \frac{7.2}{6} = 1.2$ $\quad \boxed{I_3 = 0.1777}$

$I_4 \rightarrow m_4 = \frac{5.4}{6} = 0.9$

$n_1 = \frac{10.8}{6} = 1.8$ $\quad \boxed{I_4 = 0.1899}$

total stress at C :- $330(0.143 + 0.1521 + 0.1777 + 0.1899)$

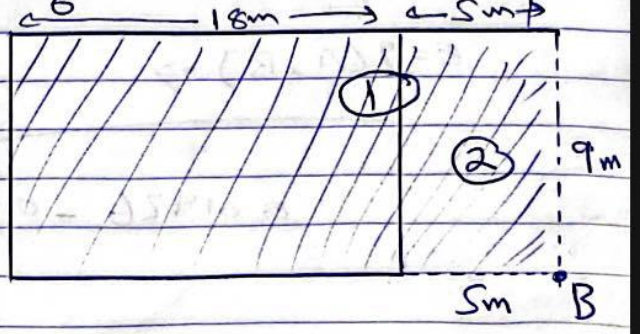
$$\boxed{\sigma_c = 218.7\ KN/m^2}$$

3) stress at B :-

(1)

$m = \frac{9}{6} = 1.5$, $n = \frac{23}{6} = 3.8 \Rightarrow I =$ interpolate

5)



① حل السؤال الرابع :

$$\frac{X - 0.225}{X - 0.2309} = \frac{1.5 - 1.4}{1.5 - 1.6} \Rightarrow \boxed{X = 0.2279} \quad ②$$

$$\frac{X - 0.226}{X - 0.232} = \frac{1.5 - 1.4}{1.5 - 1.6} \Rightarrow \boxed{X = 0.229} \quad ②$$

$$\frac{X - 0.2279}{X - 0.229} = \frac{3.8 - 3}{3.8 - 4} \Rightarrow \boxed{X = 0.2288}$$

$$\boxed{X = \bar{I} = 0.2288}$$

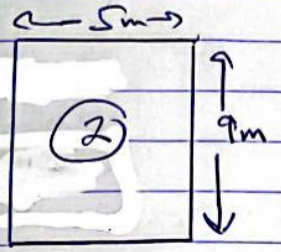
$$\sigma_{B_1} = 330 * 0.2288 = \boxed{75.504 \text{ KN/m}^2}$$

②

$B = 5m$, $L = 9m$

$m = \frac{5}{6} = 0.83$, $n = \frac{9}{6} = 1.5$

$\bar{I}$ by interpolation



$$\frac{X - 0.1739}{X - 0.1836} = \frac{0.83 - 0.8}{0.83 - 0.9} \Rightarrow X = 0.177$$

$$\frac{X - 0.1777}{X - 0.1874} = \frac{0.83 - 0.8}{0.83 - 0.9} \Rightarrow X = 0.18$$

⑥

$$\frac{X - 0.177}{X - 0.18} = \frac{1.5 - 1.4}{1.5 - 1.6} \Rightarrow X = \bar{I} = 0.1785$$

$$\sigma_{B_2} = 330 * 0.1785 = \boxed{58.9 \text{ KN/m}^2}$$

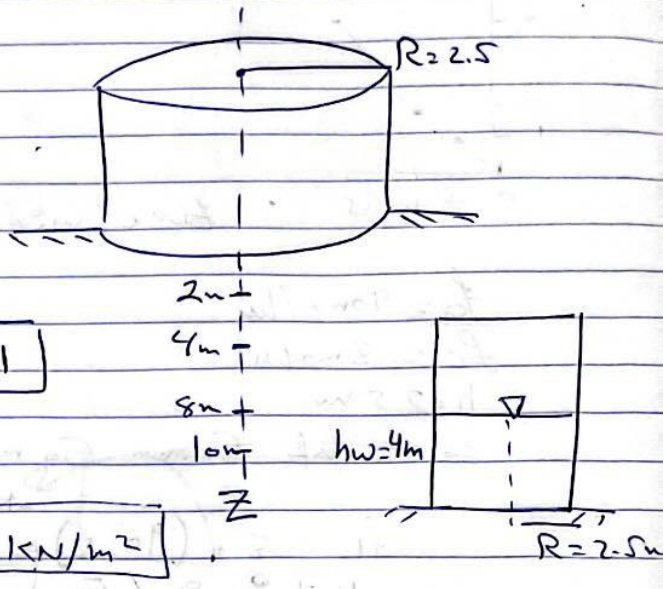
total stress at B = 75.5 − 58.9 = $\boxed{16.6 \text{ KN/m}^2}$

$\gamma_w = 10\ kN/m^3$

$q = h_w * \gamma_w$

$q = 4 * 10 = 40\ kN/m^2$

* السؤال الخامس :



$\frac{z}{R}$, $\frac{r}{R}$

$r = 0$

1) at $Z = 0$ =>

$A' \Rightarrow \frac{z}{R} = 0, \frac{r}{R} = 0 \rightarrow A' = 1$

$B' = 0$

$\sigma_1 = q(A' + B')$

$= 40(1+0) = 40\ kN/m^2$

2) at $Z = 2m$ =>

$A' \Rightarrow \frac{2}{2.5} = 0.8, \frac{0}{2.5} = 0$

$A' = 0.37531$, $B' = 0.38091$

$\sigma = 40(0.37531 + 0.38091)$

$\sigma_2 = 30.25\ kN/m^2$

3) at $Z = 4m$ =>

$\frac{z}{R} = \frac{4}{2.5} = 1.6$, $\frac{r}{R} = 0$

$A' = \frac{X - 0.16795}{X - 0.1557} = \frac{1.6 - 1.5}{1.6 - 2} \Rightarrow X = 0.1555$

$B' = \frac{X - 0.25602}{X - 0.17889} = \frac{1.6 - 1.5}{1.6 - 2} \Rightarrow X = 0.2406$

$\sigma_3 = 40(0.2406 + 0.1555) = 15.8444\ kN/m^2$

4) at $Z = 8m$

$\frac{Z}{R} = \frac{8}{2.5} = 3.2$, $\frac{r}{R} = 0$

$B' = \frac{x - 0.09487}{x - 0.05707} = \frac{3.2-3}{3.2-4} \Rightarrow x = 0.0873$

$A' = \frac{x - 0.05132}{x - 0.02986} = \frac{3.2-3}{3.2-4} \Rightarrow x = 0.04703$

$\sigma_4 = 40(0.04703 + 0.0873) = \boxed{5.4\ KN/m^2}$

5) at $Z = 10m$.

$\frac{Z}{R} = \frac{10}{2.5} = 4$, $\frac{r}{R} = 0$

$A' = 0.02986$, $B' = 0.05707$

$\sigma_5 = 40(0.02986 + 0.05707)$

$\boxed{\sigma_5 = 3.47\ KN/m^2}$

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* السؤال السابق:

$\frac{2Z}{B} = \frac{2(2)}{5} = 0.8$

$\frac{2x}{B} = \frac{2(6)}{5} = 2.4$

interpolation:-

* حل السؤال السادس :

$$\frac{x - 0.422}{x - 0.3524} = \frac{0.8 - 0.5}{0.8 - 1} \Rightarrow x = 0.3802$$ ①

$$\frac{x - 0.0152}{x - 0.0622} = \frac{0.8 - 0.5}{0.8 - 1} \Rightarrow x = 0.043$$ ②

$$\frac{x - 0.3802}{x - 0.043} = \frac{2.4 - 2}{2.4 - 3}$$

$$\boxed{x = 0.2450 = I}$$

$$\frac{\Delta G}{2} = 0.245$$

$$\Delta G = 0.245 * 400 = \boxed{98\ KN/m^2}$$

Done