Department: Civil Engineering **Level: 5** **Semester: 2st semester** **Subject: Design of Irrigation works** **Code : CIE 504**	**Ministry of Higher Education** **Higher Institute for Eng. and Tech.** **New Damietta**	**Mid-term exam** **Time allowed: 60min** **Full marks: 20 marks**

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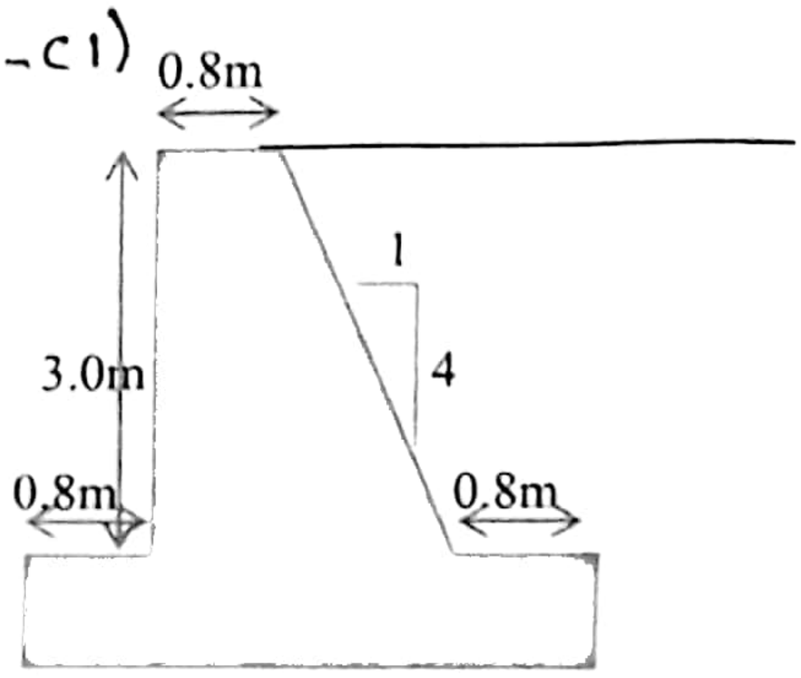
Any missing data can be reasonably assumed

Question(1) (8 Marks) (C2 - a2 , C3 - a1 , C11 - a2 , C13 - C1)

Check the overall stability of the plain concrete wall shown

(Wall slope 1:4) Soil $\gamma = 1.8t/m^3$

Soil allowable stress = 15 t/m^2 - $\Phi = 35^o$

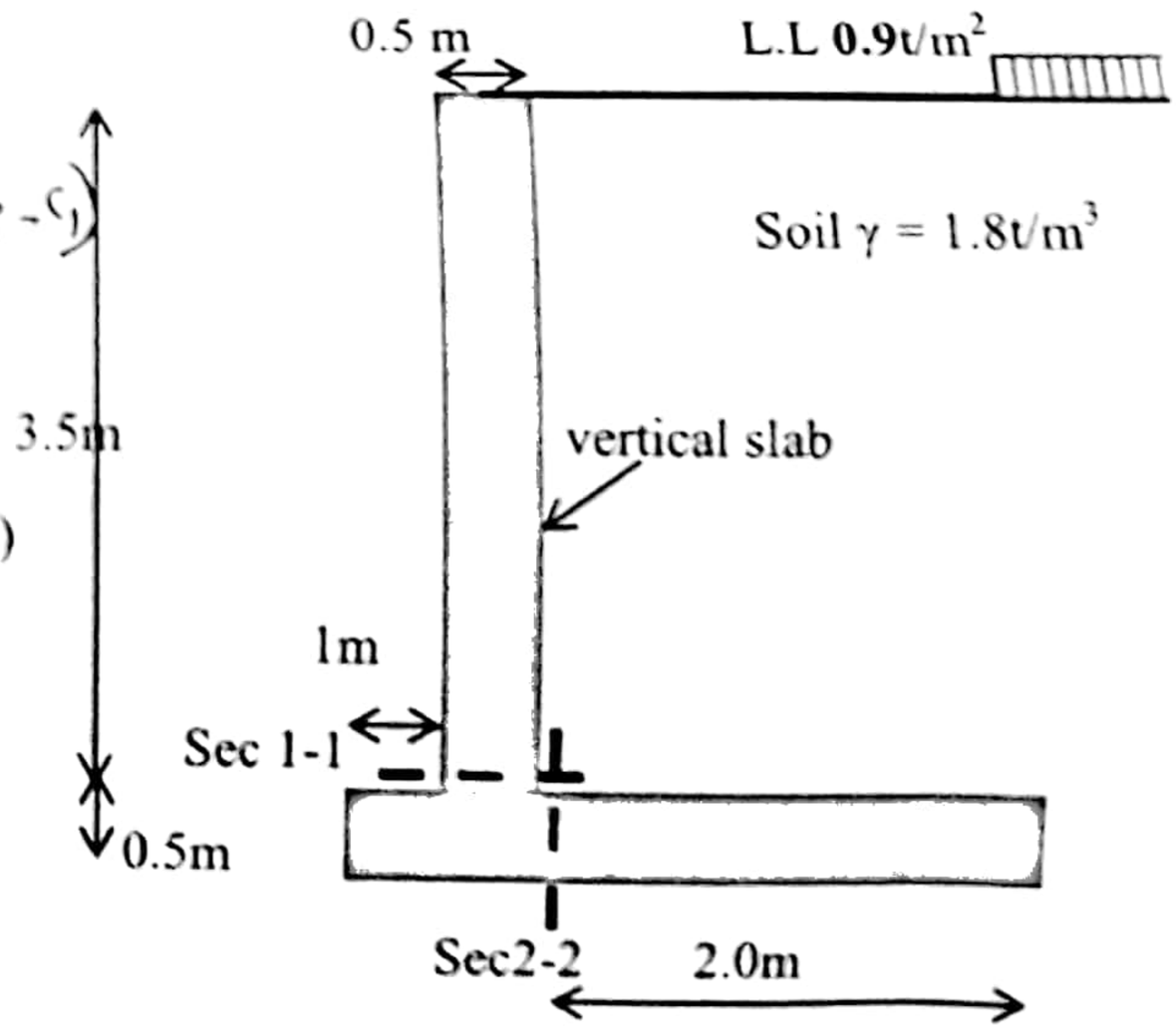


Question(2) (7 Marks) ($C_2 - a_2$, $C_{11} - a_2$, $C_{13} - C_1$)

For the cantilever wall, **design the shown sections** (Section 1-1 and Section 2-2)

Calculate area steel only

F_{all} for the soil $14t/m^2$, $\Phi = 30^o$



Question 3 (5 Marks) ($C_2 - a_2$, $C_{11} - a_2$, $C_{13} - C_1$)

For question2 if we replaced the cantilever wall by

Counter fort wall (spacing of counterfort = 3m)

Design the vertical slab (Calculate the area steel only)

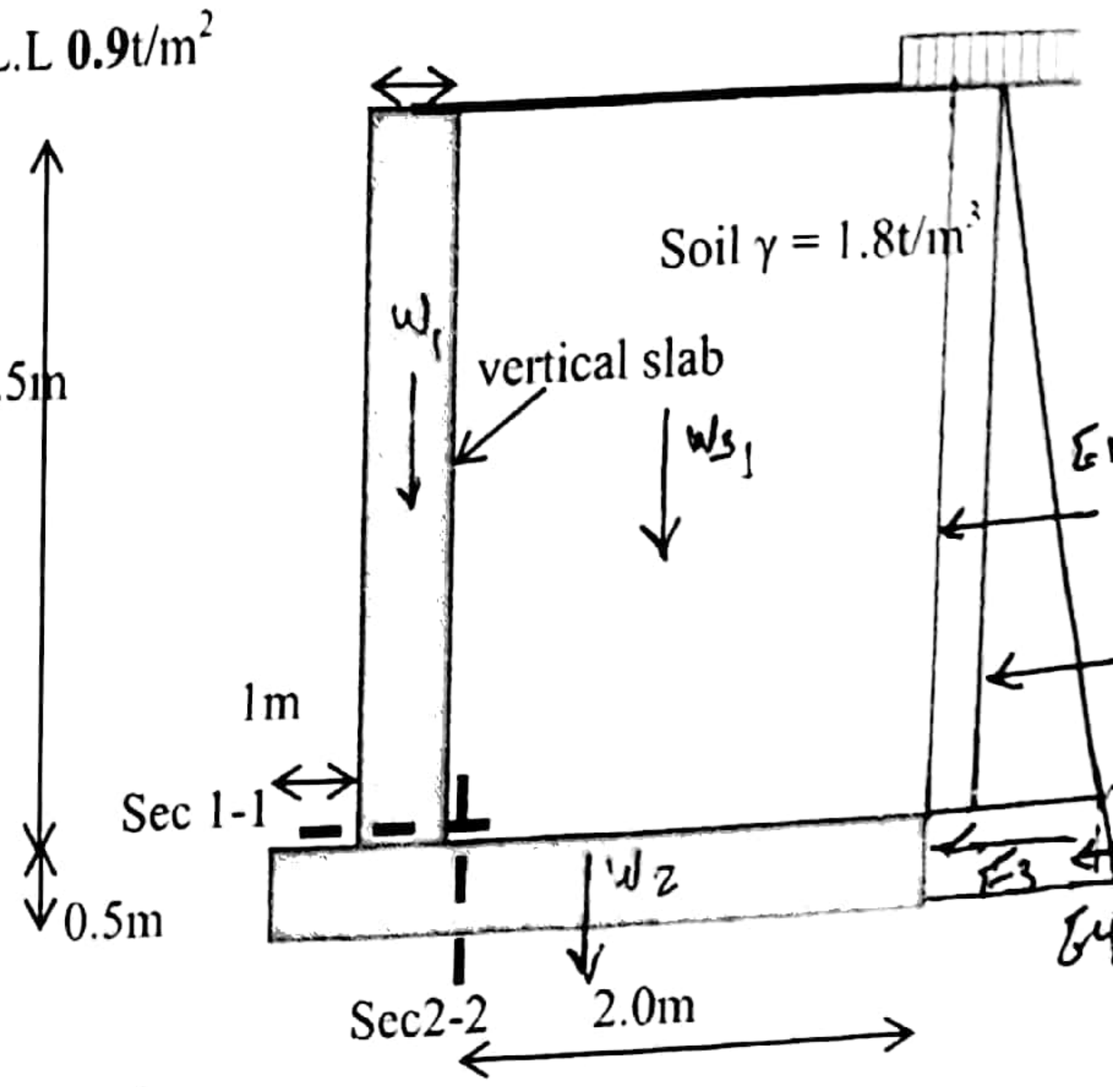
Good Luck

Prof Yasser Hamed

$K_a = 0.33$

$e_1 = 0.297$ $e_2 = 2.376$ $e_3 = 2.673$

	Y	M
$\Sigma_1 = 1.039$	2.25	2.33
$\Sigma_2 = 3.63$	1.66	6.02
$\Sigma_3 = 1.188$	0.25	0.297
$\Sigma_4 = 0.07$	0.166	0.012
$\Sigma E = 5.927$		8.659



$F_{1,2} = \frac{\Sigma w}{B}\left[1 \pm \frac{6e}{B}\right]$

$= -6.832$

-5.368

$x = 1.68m = \frac{M_{res} - M_{ot}}{\Sigma w}$

$e = 0.07$

For Sec. 1-1

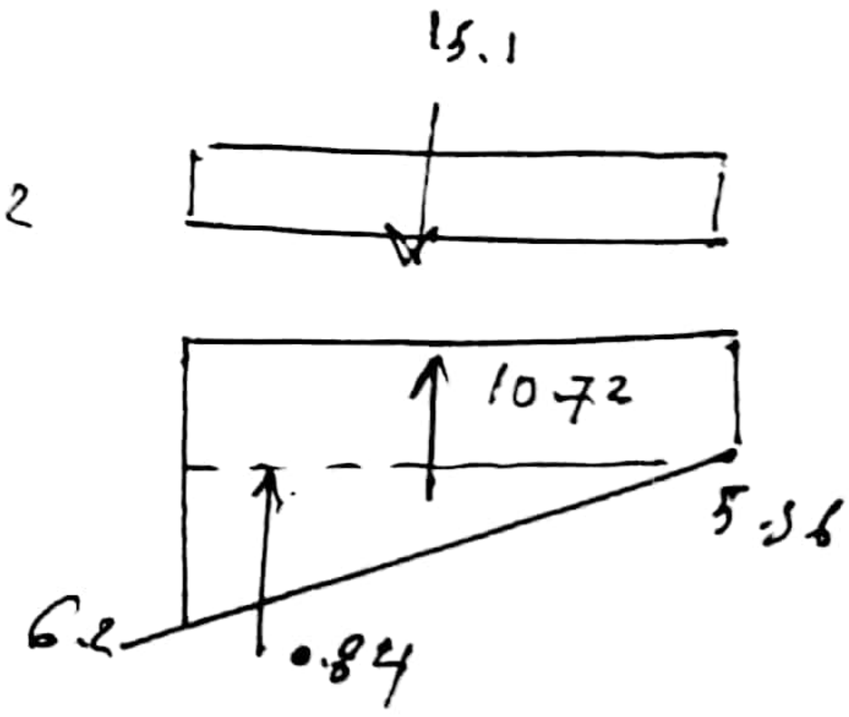
$M = 1.039 \times 1.75 + 3.63 \times 1.1 = 6.029\ m.t.$

$A_s = \frac{M \times 10^5}{K \times d} = 10.633\ cm^2$

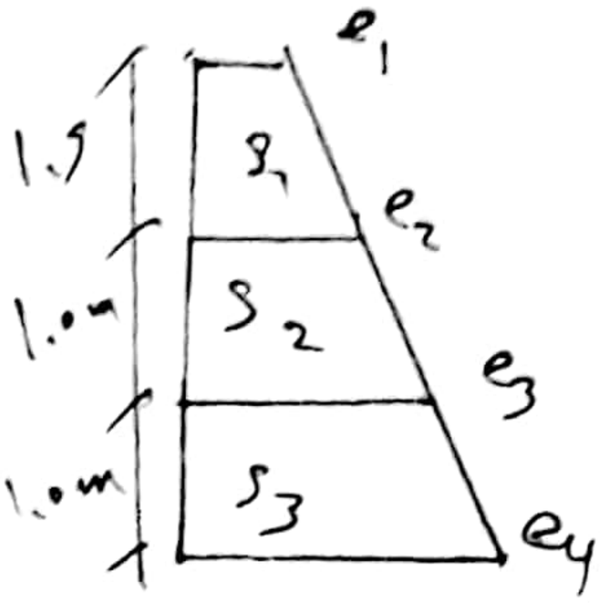
For Sec. 2-2

$M = 15.1 \times 1 - 10.72 \times 1 - 0.84 \times \frac{2}{3} = 3.92$

$A_s = 6.73\ cm^2$



Question 3 (5 Marks)



$e_1 = 0.297$

$e_2 = 1.188$

$e_3 = 1.782$

$e_4 = 2.378$

For S_1

$w = \frac{e_1 + e_2}{2} = \frac{0.297 + 1.188}{2} = 0.7425$ $\quad L = 3\,m$ $\quad \xi_2$

M (for 1.9 m) $= 0.556$ $\quad A_s$ take [redacted] /m

$A_s = \frac{M \times 10^5}{12\,d} = 1.33\,cm^2$

For S_2

$w = \frac{1.782 + 1.188}{2} \times 1 = 1.485$

$M = \frac{wL^2}{12} = \phi.\phi\phi$ $\quad A_s = \phi.95\,cm^2$ $\quad L = 3.0$

For S_3

$w = 2.075$

$M = \frac{2.075 \times 9}{12} = 1.556$ $\quad A_s = 2.74\,cm^2$

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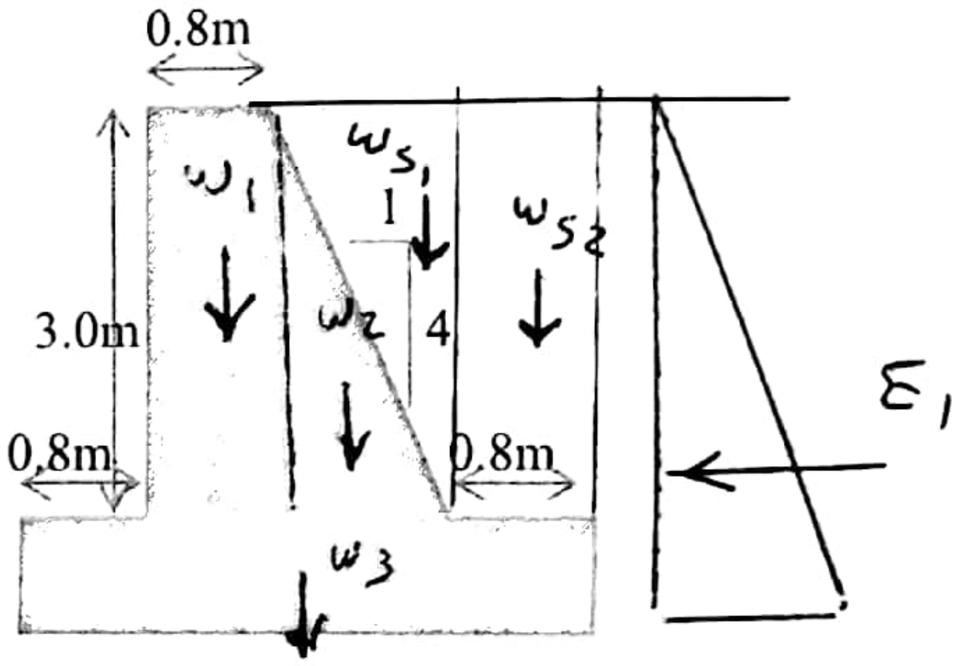
Question(1) (8 Marks)

	x	M_{res}
$w_1 = 3 \times 0.8 \times 2.2 = 5.28$ t	1.2	6.336
$w_2 = 0.5 \times 0.75 \times 3 \times 2.2 = 2.475$	1.85	4.57
$w_3 = 3.15 \times 0.8 \times 2.2 = 5.54$	1.575	8.73
$w_{s1} = 0.5 \times 0.75 \times 3 \times 1.8 = 2.025$ t	2.1	4.25
$w_{s2} = 0.8 \times 3 \times 1.8 = 4.32$ t	2.75	11.88/0.8
19.64 t		35.76 , 0.8 , 1.55 , 0.8 ,



$K_a = 0.27$ $\quad E_1 = 3.5$ $\quad M_{o.t} = 3.5 \times 1.26 = 4.43$

check overturning $= \frac{M_{res}}{M_{o.t}} = 8.07 > 2$ o.k

check sliding $= \frac{\mu \cdot \Sigma w}{\Sigma -} = 2.4 > 1.5$ o.k

Check stresses $\quad x = \frac{M_{res} - M_{o.t}}{\Sigma w} = 1.59 \quad e = \frac{B}{2} - x = 0.015$

$$F_{1_2} = -\frac{w}{B}\left(1 \pm \frac{6e}{B}\right) = \begin{matrix} -6.05 \\ -6.41 \end{matrix} < 15 \text{ t/m}^2 \text{ o.k.}$$

Question(2) (7 Marks)

	x	M
$w_1 = 4.375$	1.25	5.46
$w_2 = 4.375$	1.75	7.65
$w_{s_1} = 12.6$	2.5	31.5
$\Sigma w = 21.36$		$\Sigma M = 44.61$