CV2014 2012-2013 sem 2.

Yes, U can!

1a. (UU) - Specimen is subjected to specified confining pressure and then the principal stress difference is applied immediately.

(CU) - Specimen is consolidated under specified confining pressure and then the principal stress difference is applied with no drainage allowed.

(CD) - specimen is consolidated under specified confining pressure then the principal stress difference is applied at a slow rate to ensure that excess pore-water pressure is maintained at zero.

b.i) Before.

$\sigma = 18 \times 5 = 90\,KN$. $\quad u = 9.81 \times 5 = 49.05\,KN$.

$\sigma' = \sigma - u = 90 - 49.05 = 40.95\,KN$.

After

$\sigma = 0$. $\quad \sigma' = 40.95\,KN$.

$\sigma = \sigma' + u$ Assume no water loss?

$u = -\sigma'$

$= -40.95\,KN$

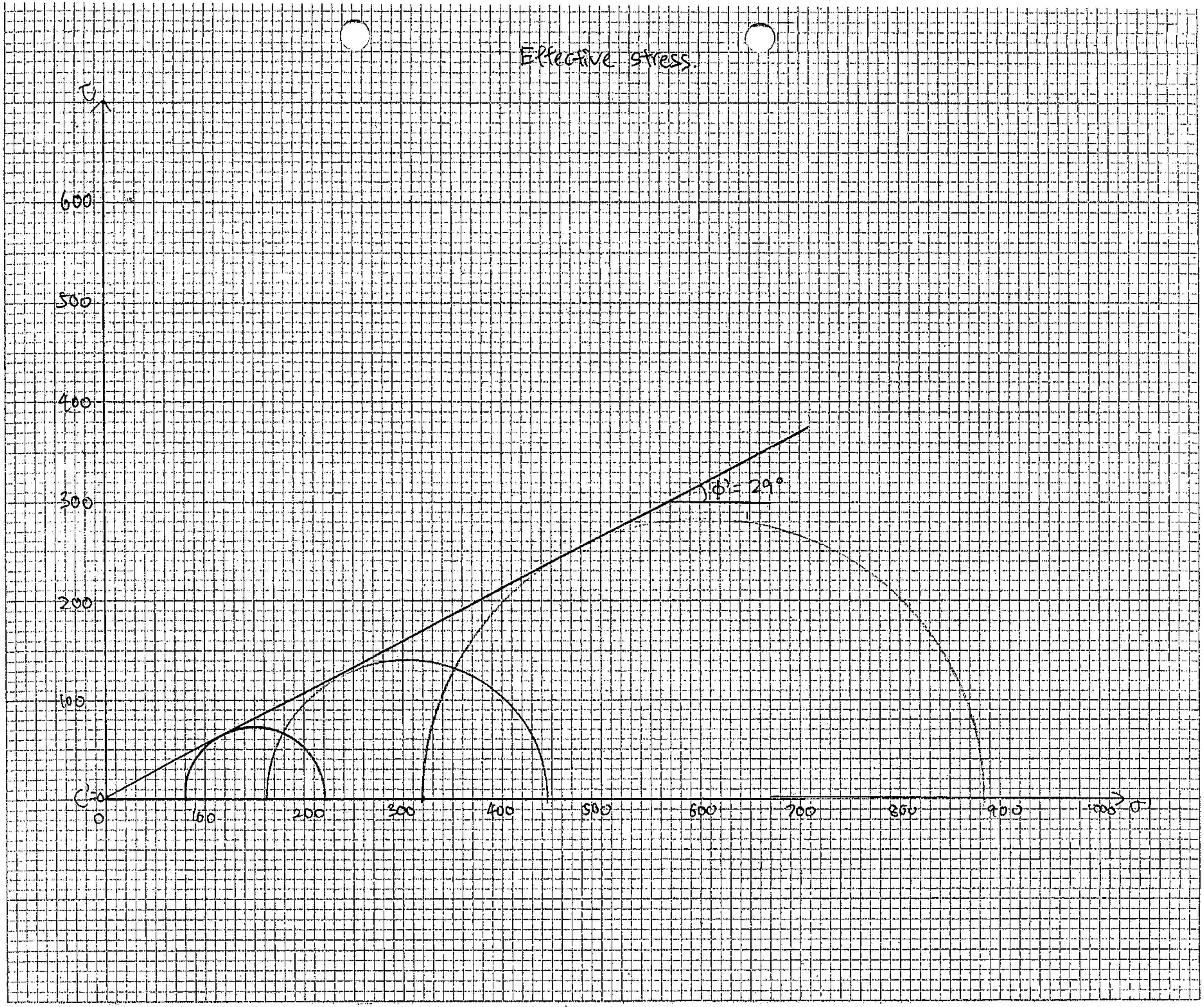
ii) A back pressure can be applied to soil specimen to ensure 100% saturation. A high enough back pressure will drive the pore air into solution in the pore water.

Yes, U can!

σ_3	u_f	σ'_3	$(\sigma_1-\sigma_3)$	σ_1	σ'_1
100	20	80	142	242	222
200	40	160	283	483	443
400	79	321	568	968	902.

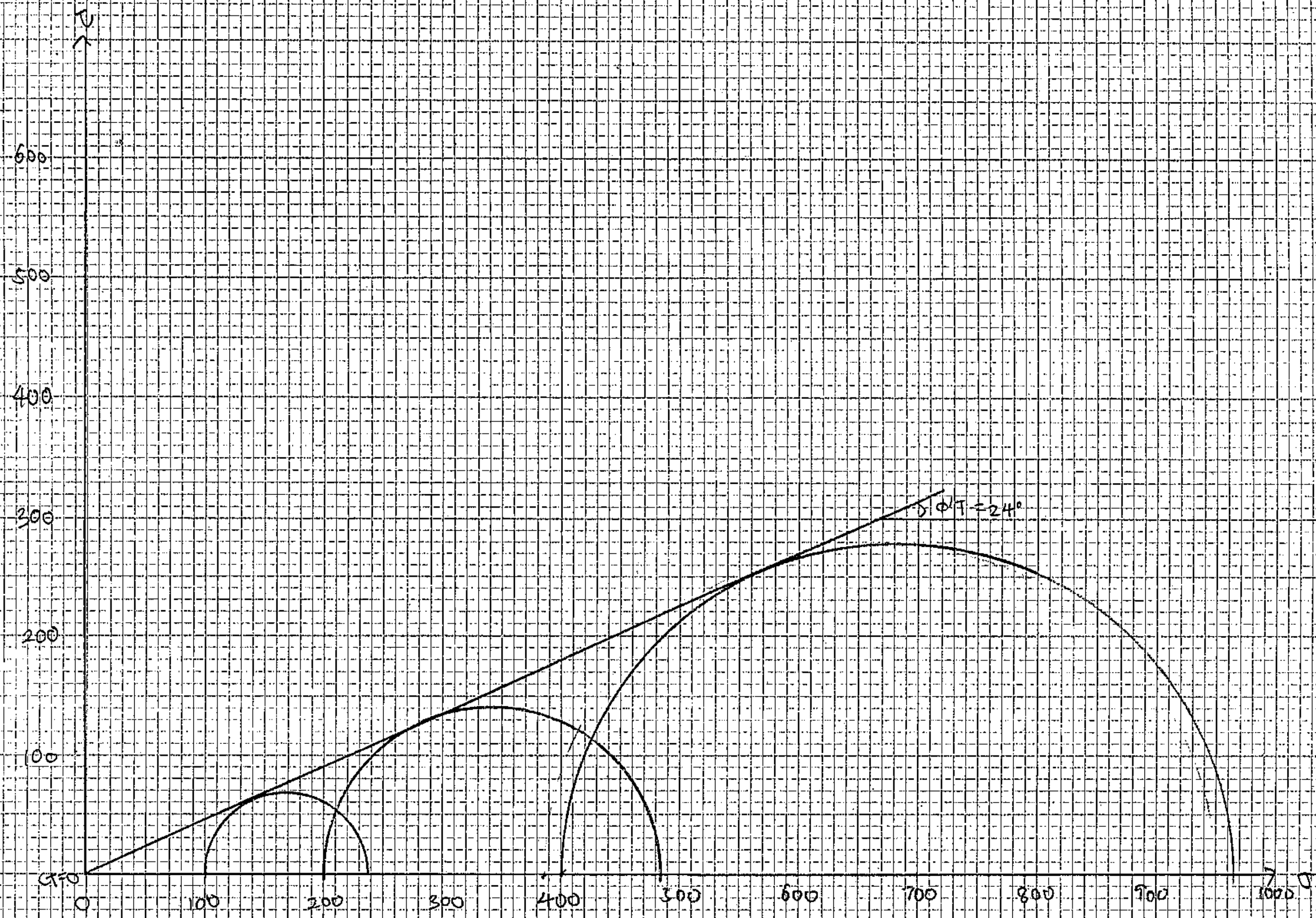
Refer to graph $C_T = 0$ $\phi'_T = 24°$

$c' = 0$ $\phi' = 29°$



2 mm Square 20 cm x 24 cm

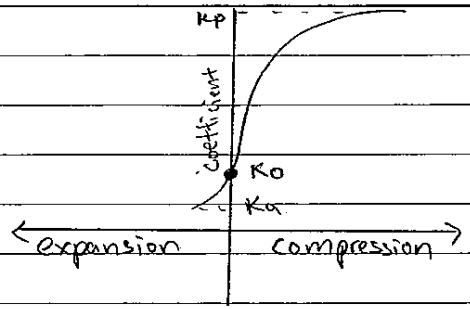
Total stress.



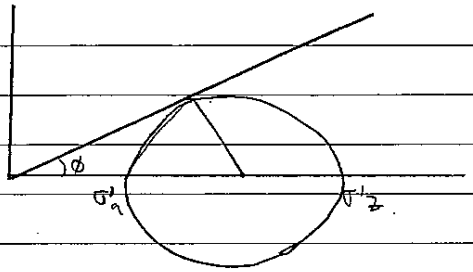
2 mm Square 20 cm x 24 cm

Yes, U can!

2a.



2b.



$$\sin\phi' = \frac{\frac{1}{2}(\sigma'_z - \sigma'_a)}{\frac{1}{2}(\sigma'_z + \sigma'_a)}$$

$\sigma'_z \sin\phi' + \sigma'_a \sin\phi' = \sigma'_z - \sigma'_a$.

$\sigma'_a + \sigma'_a \sin\phi' = \sigma'_z - \sigma'_z \sin\phi'$

$\sigma'_a(1+\sin\phi') = \sigma'_z(1-\sin\phi)$.

$K_a = \frac{\sigma'_z}{\sigma'_a} = \frac{1-\sin\phi}{1+\sin\phi}$

c). $K_{a_1} = 0.333$ $K_{a_2} = 0.217$. $P_{a_1} = 4.6$

active side.

σ' at 1m = 16.5 KN

σ' at 3m = 29.88 KN. $16.5 + (16.5-9.81)(2)$

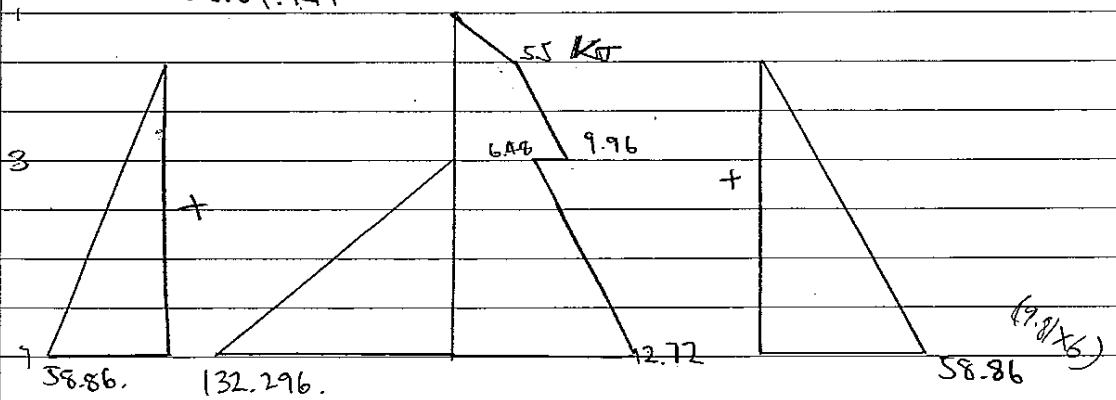
σ' at 7m = $29.88 + (17-9.81)\times 4$

= 58.64. KN

Passive side.

σ' at 3m = 0

σ' at 7m = 28.76 KN.



Yes, U can!

3a. i) $FS = 1.5$

$= \frac{Cular}{wd}$

$\frac{Cu \times \frac{89.5}{360} \times 2\pi r \times r}{70 \times 18 \times d} = 1.5$

$\frac{Cu \times \frac{89.5}{360} \times 2\pi \times 12.1^2}{1260 \times 4.5} = 1.5$

$Cu = 37.19$

ii) $FS = \frac{Cular}{wdt + P \times (d+1)}$

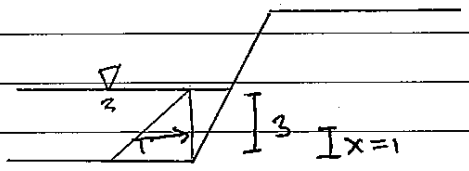
$\frac{Cu \times \frac{89.5}{360} \times 2\pi \times 12.1^2}{1260 \times 4.5 + 100 \times 5.5} = 1.5$

$Cu = 40.795.$

iii). $FS = \frac{Cular + T(11.5 - x)}{wdt + P \times (d+1).}$

$\frac{Cu \times \frac{89.5}{360} \times 2\pi \times 12.1^2 + 44.145 \times 10.5}{1260 \times 4.5 + 100 \times 5.5} = 1.5$

$Cu = 38.76.$



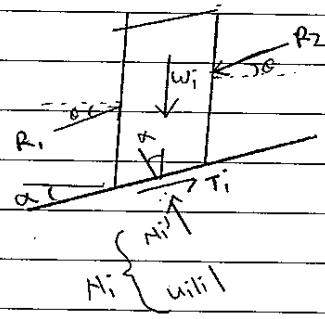
assume hydrostatic pressure acting horizontally.

$T = 9.81 \times 3 \times 3 \times 0.5$

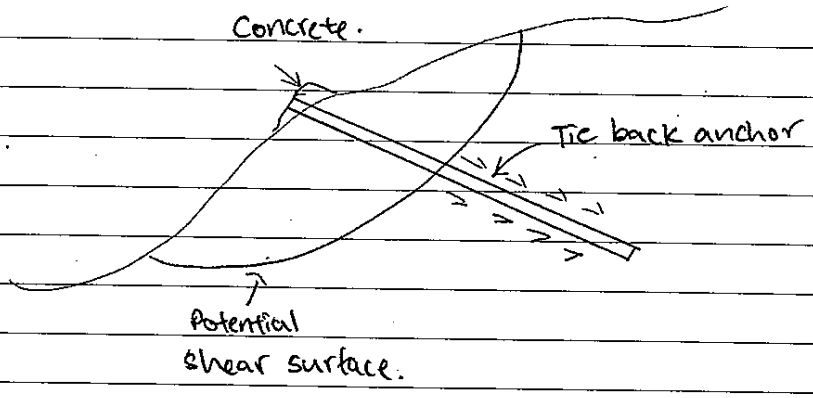
$= 44.145.$

Yes, U can!

b. assumption : resultant forces are parellel and in which both force and moment equilibrium are satisfied.



c.



The tensile member that apply stabilizing force onto the slope by extend well beyond the critical failure surface.

Yes, U can!

4a. The pore water within clay layer are not easily expelled by sheepsfoot rollers. The main factor that controls densification of clean loose sands using vibro-compaction is the silt and clay content within the soil. If the clay content is too high, vibro-compaction is not effective.

b. relative density $= \frac{e_{max} - e}{e_{max} - e_{min}}$.

Before

$\frac{0.92 - e}{0.92 - 0.35} = 0.2$

$e = 0.806$

After

$\frac{0.92 - e}{0.92 - 0.35} = 0.7$

$e = 0.521$.

use vibro-compaction for loose sand. effective depth 3-15 m.

c. $m.c = \frac{1945 - 1845}{1845} = 5.42\%$ Not OK.
$< (12.5 \pm 2.5)\%$

$993 cm^3 = 0.000993 m^3$

$\frac{1.845 \times 9.81}{0.000993} = 18.227 \ KN/m^3$

$R.C = \frac{18.227}{18.5} = 98.5\% > 95\% \therefore OK.$

Compaction not meeting standard due to m.c.

assume 1 m^3 of soil

$V_S = \frac{18.227}{2.7 \times 9.81} = 0.688.$

$V_V = 0.312.$

$V_W = \frac{0.0542 \times 18.227}{9.81} = 0.1$

degree sat $= \frac{V_W}{V_V} = \frac{0.1}{0.312}$
$= 32\%.$

Yes, U can!

d. Both concrete and soil are strong in compression but weak in tension. By placing of steel reinforcing bars, it significantly improve its stability and load carrying capacity. Especially useful in the construction of compacted fill slopes and earth-retaining structures.