TUGAS KULIAH 3
Kerjakan soal soal di bawah ini

1. Suatu profil tanah terdiri dari tiga lapisan. Lapisan pertama terdiri dari tanah kerikil dengan tebal 3 m (γ = 16 kN/m^3), lapisan kedua berupa lempung dengan tebal 2 m (γ_{sat} = 19 kN/m^3), dan lapisan ketiga berupa pasir dengan tebal 3 m (γ_{sat} = 19 kN/m^3). Muka air tanah pada permukaan tanah lempung.

    a. Gambar diagram tekanan total, tekanan efektif, dan tekanan air pori terhadap kedalaman
    b. Gambar diagram yang sama bila suatu beban merata sebesar 50 kN/m^2 diletakkan dengan cepat pada permukaan tanah.
    c. Gambarkan diagram tekanan total setelah proses konsolidasi (keluarnya air dari pori pori tanah) selesai.

2. Suatu profil tanah terdiri dari lapisan lempung dengan tebal 6 m (γ_{sat} = 21 kN/m^3), dan lapisan pasir dengan setebal 3 m (γ_{sat} = 22 kN/m^3). Muka air tanah sama dengan permukaan tanah. Di atas lapisan lempung terdapat beban merata sebesar 25 kN/m^2.
    a. Gambar diagram tekanan total, tekanan efektif, dan tekanan air pori vs. kedalaman
    b. Gambar diagram yang sama bila beban merata tersebut dihilangkan.

3. Suatu kolam dengan kedalaman 5m terletak diatas tanah lempung (γ_{sat} = 19 kN/m^3). Tebal lapisan lempung tersebut 5m. Dibawah lapisan tanah lempung terdapat lapisan pasir setebal 5m (γ_{sat} = 18 kN/m^3).
    a. Gambar diagram tekanan total, tekanan efektif, dan tekanan air pori vs. kedalaman
    b. Gambar diagram yang sama bila kolam di keringkan airnya.

4. Suatu propil tanah terdiri dari lapisan lempung dengan tebal 4m (γ_{sat} = 19 kN/m^3), dan lapisan pasir dengan setebal 2m (γ_{sat} = 18 kN/m^3). Muka air tanah sama dengan permukaan tanah. Suatu piezometer dimasukkan ke dalam lapisan pasir dan tinggi air dalam piezometer adalah 2m di atas permukaan tanah.
    a. Gambar diagram tekanan total, tekanan efektif, dan tekanan air pori vs. kedalaman
    b. Gambar diagram yang sama bila tinggi air dalam piezometer adalah 1m di atas permukaan tanah.

5. Suatu profil tanah terdiri dari lapisan kerikil dengan tebal 10m (γ_{sat} = 22 kN/m^3) di atas lapisan lempung dengan tebal 10m (γ_{sat} = 20 kN/m^3). Muka air tanah sama dengan permukaan tanah. Berat jenis kering kerikil adalah 17 kN/m^3.
    a. Gambar diagram tekanan total, tekanan efektif, dan tekanan air pori vs. kedalaman
    b. Gambar diagram yang sama setelah terjadi penambahan beban merata sebesar 30 kN/m3.
    c. Gambar diagram yang sama apabila beban merata (pada soal b) telah menyebabkan pengeringan tanah kerikil (muka air tanah turun sampai permukaan tanah lempung)

6. Suatu lapisan pasir (γ = 16 kN/m^3, γ_{sat} = 19 kN/m^3) dengan tebal 9 m terdapat di atas lapisan lempung dengan permeabilitas yang sangat rendah (γ_{sat} = 20 kN/m^3). Tebal lapisan lempung tersebut adalah 6 m. Muka air tanah terletak 6 m dibawah permukaan tanah. Dalam waktu singkat tiba-tiba muka air tanah naik 3 m dan diharapkan tetap pada posisi yang baru. Tentukan tekanan efektif pada kedalaman 8 dan 12 m dibawah permukaan tanah (a) Segera setelah kenaikan muka air tanah, dan (b) beberapa tahun setelah peristiwa kenaikan muka air tanah.

7. Suatu lapisan lempung dengan tebal 4 m terdapat di antara dua lapisan pasir dengan tebal masing-masing 4 m. Muka air tanah terletak 2 m dibawah muka tanah, tapi lapisan pasir yang dibawah berada pada tekanan artesian sehingga muka air piezometrik adala 4 m di atas muka tanah. Untuk lapisan pasir γ = 16.5 kN/m^3 dan γ_{sat} = 19 kN/m^3 , sedangkan untuk tanah lempung γ_{sat} = 20 kN/m^3. Hitung tekanan efektif di atas dan dibawah lapisan pasir.

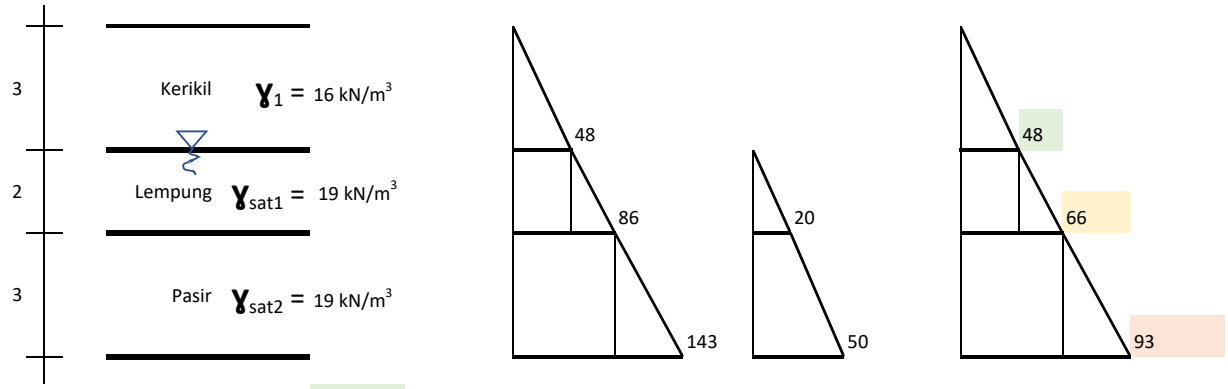
SOAL NO 1

Nama : Idwan Rozanova
NIM : 182710028

Diketahui :

h1 =	3,0 m	γ_1 =	16 kN/m^3	48,0
h2 =	2,0 m	γ_{sat1} =	19 kN/m^3	38,0
h3 =	3,0 m	γ_{sat2} =	19 kN/m^3	57,0
				143

Penyelesaian : 1.A

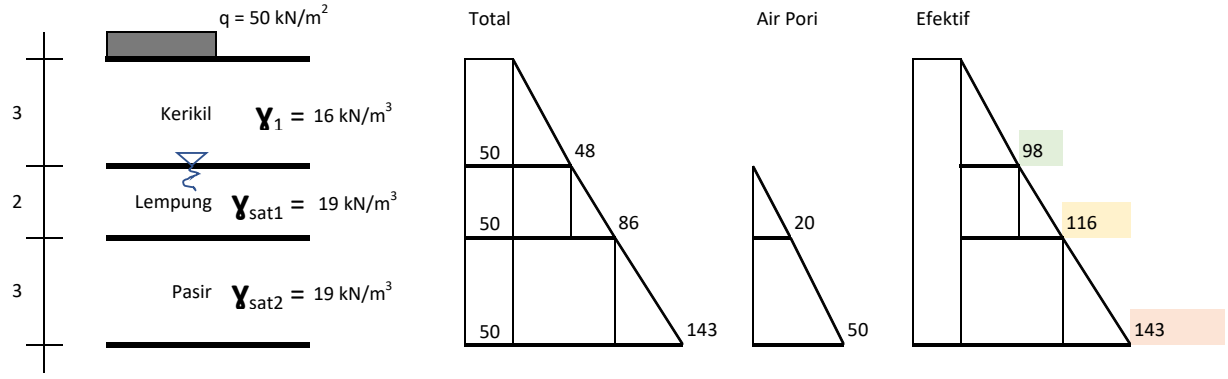


$\sigma_1 = h1 . \gamma_1 =$ 48,0 kN/m^2 143

$\sigma_2 = h1 . \gamma_1 + h2 (\gamma_{sat1} - \gamma_w) =$ 66,0 kN/m^2

$\sigma_3 = h1 . \gamma_1 + h2 (\gamma_{sat1} - \gamma_w) + h3 (\gamma_{sat2} - \gamma_w) =$ 93,0 kN/m^2

Penyelesaian : 1.B



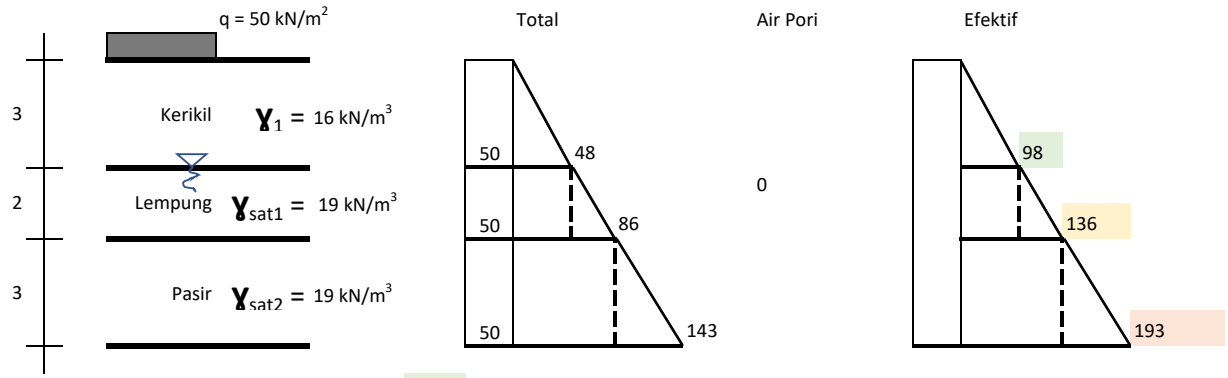
$\sigma_q =$ 50,0 kN/m^2

$\sigma_1 = \sigma_q + h1 . \gamma_1 =$ 98,0 kN/m^2

$\sigma_2 = \sigma_q + h1 . \gamma_1 + h2 (\gamma_{sat1} - \gamma_w) =$ 116,0 kN/m^2

$\sigma_3 = \sigma_q + h1 . \gamma_1 + h2 (\gamma_{sat1} - \gamma_w) + h3 (\gamma_{sat2} - \gamma_w) =$ 143,0 kN/m^2

Penyelesaian : 1.C



$\sigma_1 = \sigma_q + h1 . \gamma_1 =$ 98,0 kN/m^2

$\sigma_2 = \sigma_q + h1 . \gamma_1 + h2 . \gamma_{sat1} =$ #### kN/m^2

$\sigma_3 = \sigma_q + h1 . \gamma_1 + h2 . \gamma_{sat1} + h3 . \gamma_{sat2} =$ 193,0 kN/m^2

SOAL NO 2

Nama : Idwan Rozanova
NIM : 182710028

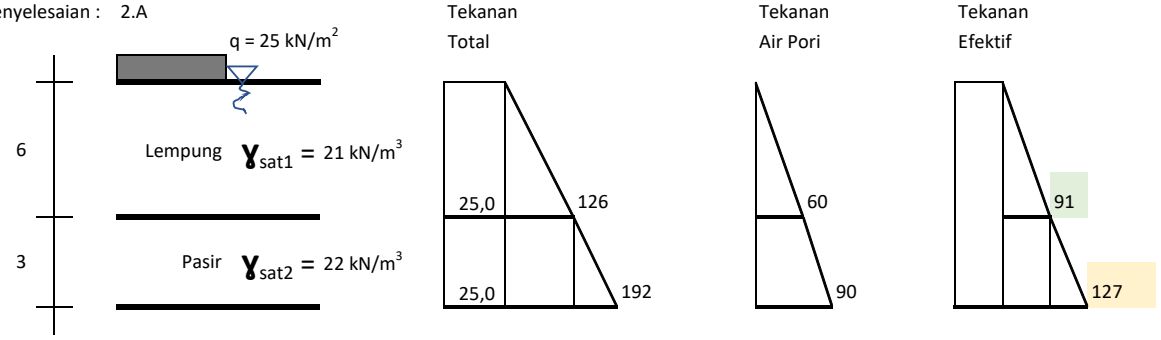
Diketahui :

h1 = 6,0 m γ_{sat1} = 21,0 kN/m^3

h2 = 3,0 m γ_{sat2} = 22,0 kN/m^3

q = 25,0 kN/m^2

Penyelesaian : 2.A

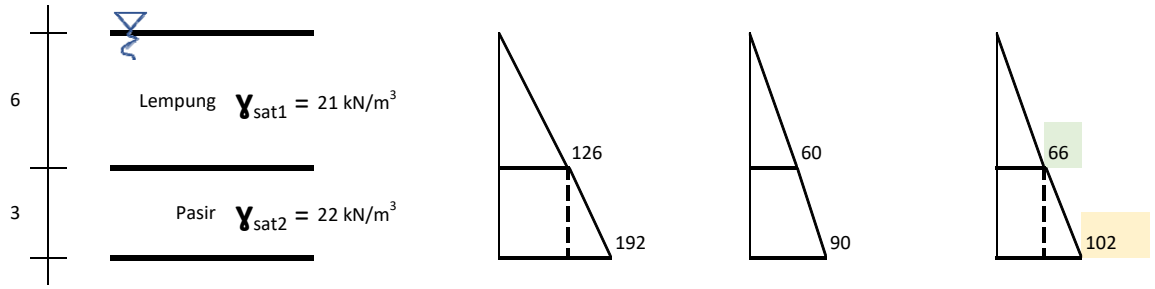


σ_q = 25,0 kN/m^2

$\sigma_1 = \sigma_q + h_1 (\gamma_{sat1} - \gamma_w)$ = 91,0 kN/m^2

$\sigma_2 = \sigma_q + h_1 (\gamma_{sat1} - \gamma_w) + h_2 (\gamma_{sat2} - \gamma_w)$ = 127,0 kN/m^2

Penyelesaian : 2.B



$\sigma_1 = h_1 (\gamma_{sat1} - \gamma_w)$ = 66,0 kN/m^2

$\sigma_2 = h_1 (\gamma_{sat1} - \gamma_w) + h_2 (\gamma_{sat2} - \gamma_w)$ = 102,0 kN/m^2

SOAL NO 3

Nama : Idwan Rozanova
NIM : 182710028

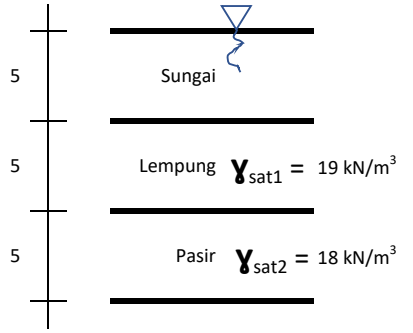
Diketahui :

h1 = 5,0 m

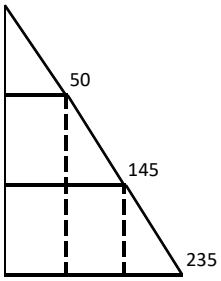
h2 = 5,0 m γ_{sat1} = 19,0 kN/m^3

h2 = 5,0 m γ_{sat2} = 18,0 kN/m^3

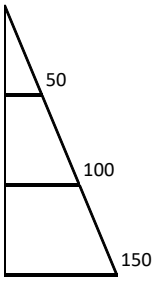
Penyelesaian : 3.A



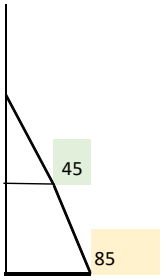
Tekanan Total



Tekanan Air Pori



Tekanan Efektif

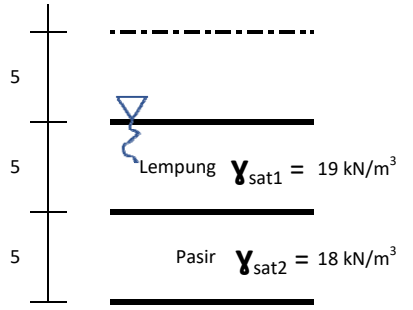


σ_1 = 0,0 kN/m^2

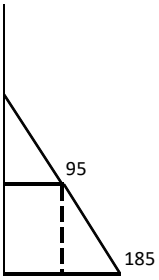
$\sigma_2 = h_2 (\gamma_{sat1} - \gamma_w)$ = 45,0 kN/m^2

$\sigma_3 = h_2 (\gamma_{sat1} - \gamma_w) + h_3 (\gamma_{sat2} - \gamma_w)$ = 85,0 kN/m^2

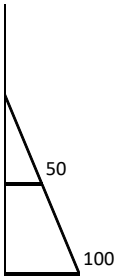
Penyelesaian : 3.B



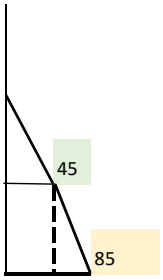
Tekanan Total



Tekanan Air Pori



Tekanan Efektif



$\sigma_1 = h_1 (\gamma_{sat1} - \gamma_w)$ = 45,0 kN/m^2

$\sigma_2 = h_1 (\gamma_{sat1} - \gamma_w) + h_2 (\gamma_{sat2} - \gamma_w)$ = 85,0 kN/m^2

SOAL NO 4

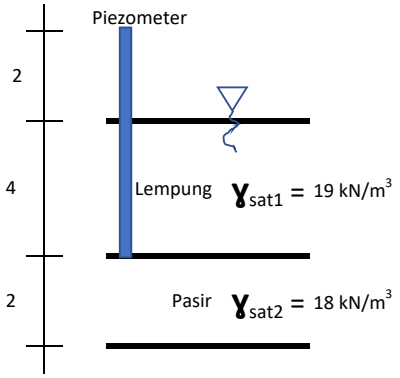
Diketahui :

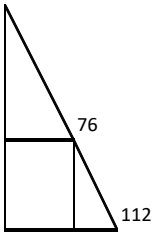
h0 = 2,0 m

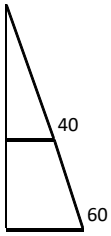
h1 = 4,0 m γ_{sat1} = 19,0 kN/m^3

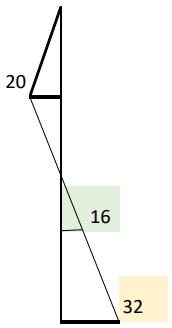
h2 = 2,0 m γ_{sat2} = 18,0 kN/m^3

Penyelesaian : 4.A









σ_w = 20,0 kN/m^2

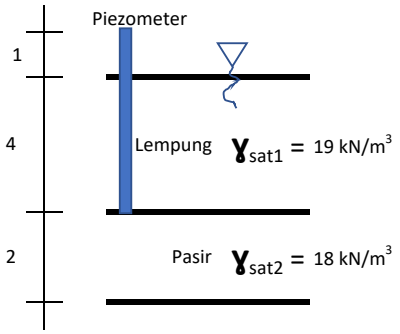
$\sigma_1 = h_1 (\gamma_{sat1} - \gamma_w) - \sigma w$ = 16,0 kN/m^2

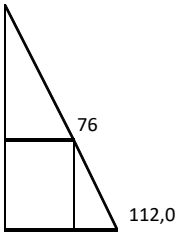
$\sigma_2 = h_1 (\gamma_{sat1} - \gamma_w) + h_2 (\gamma_{sat2} - \gamma_w) - \sigma w$ = 32,0 kN/m^2

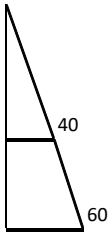
Nama : Idwan Rozanova

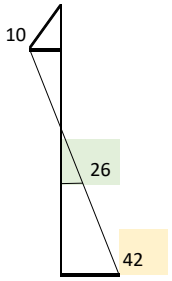
NIM : 182710028

Penyelesaian : 4.B









σ_r = 10,0 kN/m^2

$\sigma_1 = h_1 (\gamma_{sat1} - \gamma_w) - \sigma w$ = 26,0 kN/m^2

$\sigma_2 = h_1 (\gamma_{sat1} - \gamma_w) + h_2 (\gamma_{sat2} - \gamma_w) - \sigma w$ = 42,0 kN/m^2

SOAL NO 5

Nama : Idwan Rozanova
NIM : 182710028

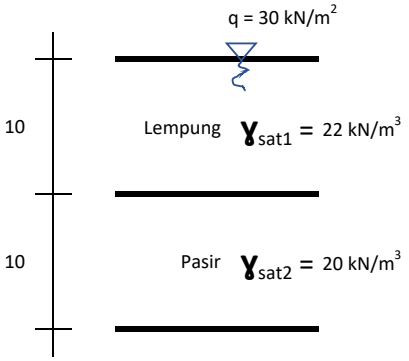
Diketahui :

h1 = 10 m γ_{sat1} = 22,0 kN/m^3

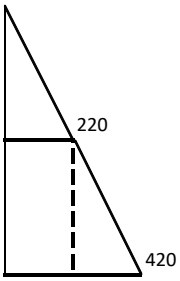
h2 = 10 m γ_{sat2} = 20,0 kN/m^3

q = 30,0 kN/m^2

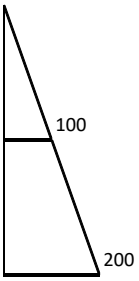
Penyelesaian : 5.A



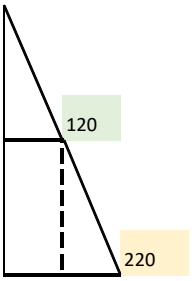
Tekanan Total



Tekanan Air Pori



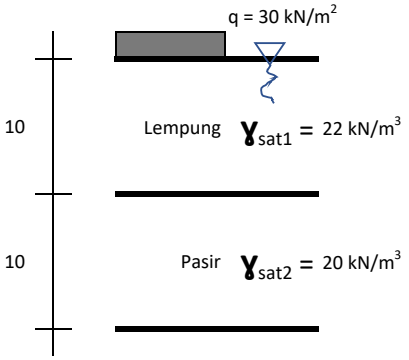
Tekanan Efektif



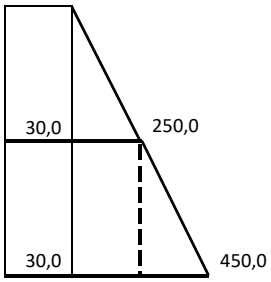
$\sigma_1 = \sigma_q + h_1 (\gamma_{sat1} - \gamma_w)$ = 120,0 kN/m^2

$\sigma_2 = \sigma_q + h_1 (\gamma_{sat1} - \gamma_w) + h_2 (\gamma_{sat2} - \gamma_w)$ = 220,0 kN/m^2

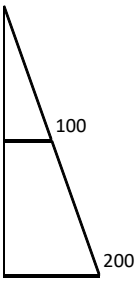
Penyelesaian : 2.B



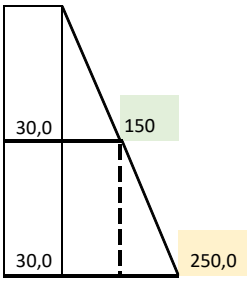
Tekanan Total



Tekanan Air Pori



Tekanan Efektif



σ_q = 30,0 kN/m^2

$\sigma_1 = \sigma_q + h_1 (\gamma_{sat1} - \gamma_w)$ = 150,0 kN/m^2

$\sigma_2 = \sigma_q + h_1 (\gamma_{sat1} - \gamma_w) + h_2 (\gamma_{sat2} - \gamma_w)$ = 250,0 kN/m^2

SOAL NO 6

Nama : Idwan Rozanc
NIM : 182710028

Diketahui :

h0 = 3 m

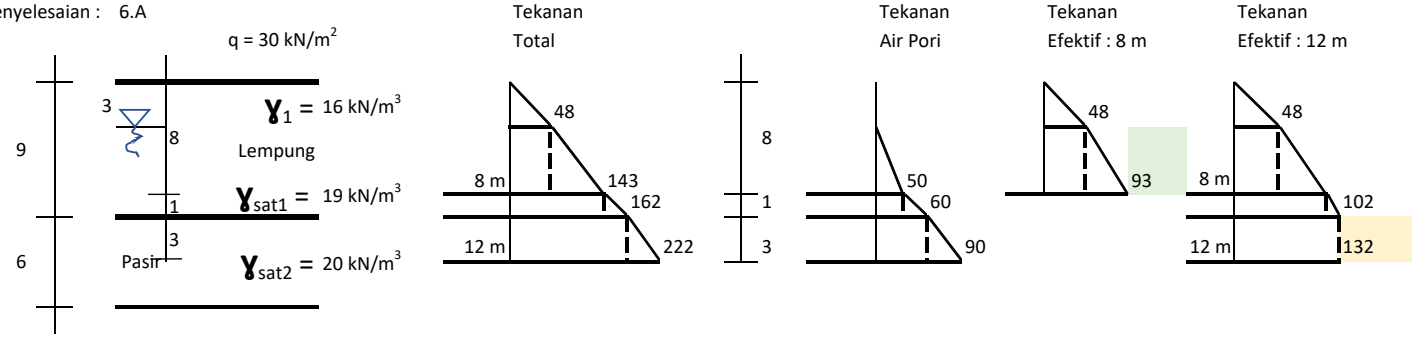
h1 = 9 m γ_{sat1} = 19,0 kN/m^3 γ_1 = 16,0 kN/m^3

h2 = 6 m γ_{sat2} = 20,0 kN/m^3

z1 = 8 m

z2 = 12 m

Penyelesaian : 6.A



z1 = 8 σ_w = 50 kN/m^2

$\sigma_1 = h_0(\gamma_1)$ = 48 kN/m^2

$\sigma_2 = h_0(\gamma_1) + (z - h_0)(\gamma_{sat1} - \gamma_w)$ = 93,0 kN/m^2 (Tekanan tanah di kedalaman : 8 m)

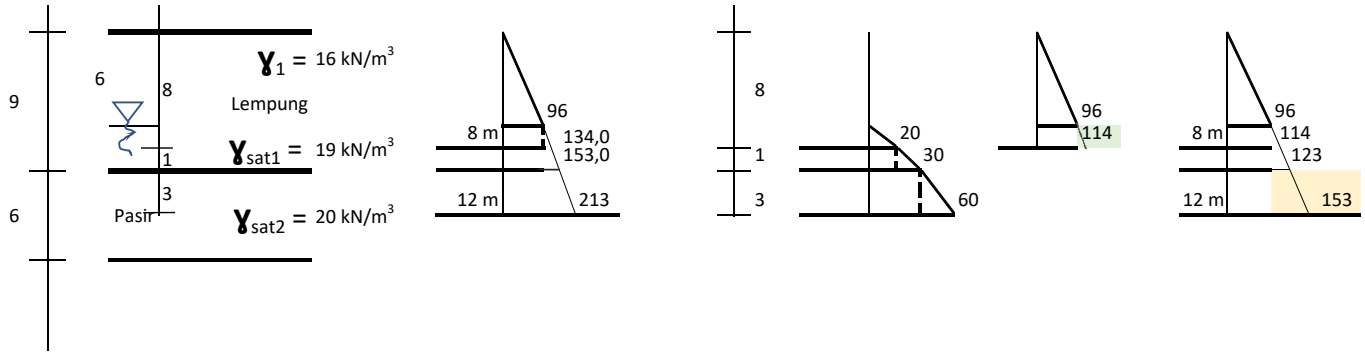
z2 = 12 σ_w = 50 kN/m^2

$\sigma_1 = h_0(\gamma_1)$ = 48 kN/m^2

$\sigma_2 = h_0(\gamma_1) + (z - h_0)(\gamma_{sat1} - \gamma_w)$ = 102,0 kN/m^2

$\sigma_3 = h_0(\gamma_1) + (z - h_0)(\gamma_{sat1} - \gamma_w) + (z - h_1)(\gamma_{sat2} - \gamma_w)$ = 132,0 kN/m^2 (Tekanan tanah di kedalaman : 12 m)

Penyelesaian : 6.B



z = 8 σ_w = 20 kN/m^2

$\sigma_1 = h_0(\gamma_1)$ = 96 kN/m^2

$\sigma_2 = h_0(\gamma_1) + (z - h_0)(\gamma_{sat1} - \gamma_w)$ = 114,0 kN/m^2 (Tekanan tanah di kedalaman : 8 m)

z = 12 σ_w = 20 kN/m^2

$\sigma_1 = h_0(\gamma_1)$ = 96 kN/m^2

$\sigma_2 = h_0(\gamma_1) + (h_1 - h_0)(\gamma_{sat1} - \gamma_w)$ = 123,0 kN/m^2

$\sigma_3 = h_0(\gamma_1) + (z - h_0)(\gamma_{sat1} - \gamma_w) + (z - h_1)(\gamma_{sat2} - \gamma_w)$ = 153,0 kN/m^2 (Tekanan tanah di kedalaman : 12 m)

SOAL NO 7

Nama : Idwan Rozanova
NIM : 182710028

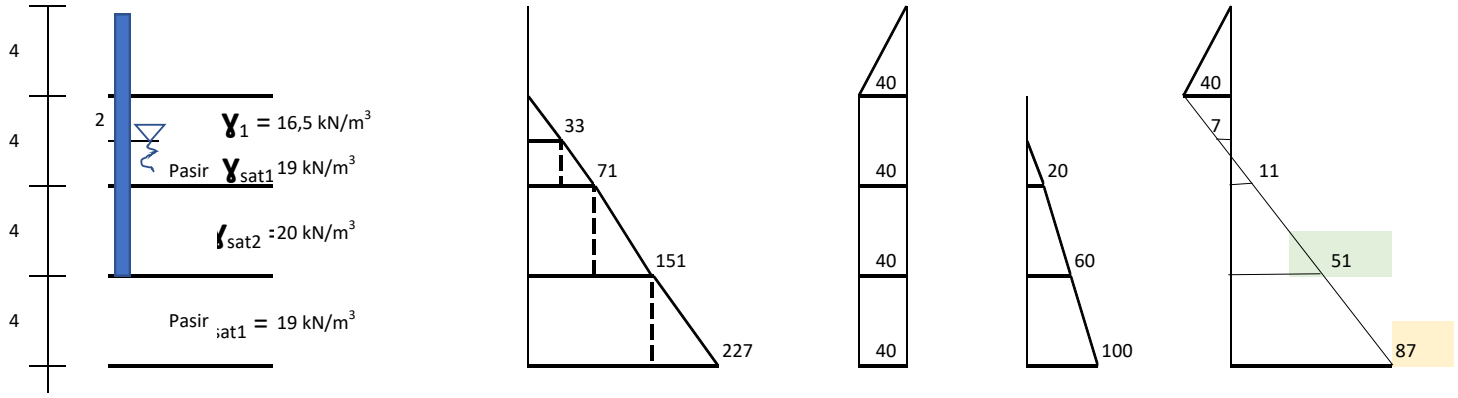
Diketahui :

h0 = 4 m

h1 dan h3 = 4 m γ_{sat1} = 19,0 kN/m^3 γ_1 = 16,5 kN/m^3

h2 = 4 m γ_{sat2} = 20,0 kN/m^3

Penyelesaian : 6.A



σ_r = 40 kN/m^2

σ_0 = h_0 (γ 33 kN/m^2

σ_1 = h_0 (γ_1) + 1/2 h_1 (γ_{sat1} - γ_w) - σr = 11 kN/m^2

σ_2 = h_0 (γ_1) + 1/2 h_1) (γ_{sat1} - γ_w) + h_2 (γ_{sat2} - γ_w) - σr = 51 kN/m^2

σ_3 = h_0 (γ_1) + 1/2 h_1) (γ_{sat1} - γ_w) + h_2 (γ_{sat2} - γ_w) + h3 (γsat2 - γw) - σr = 87 kN/m^2

Nama : M. Nasrullah

NIM : 182710034

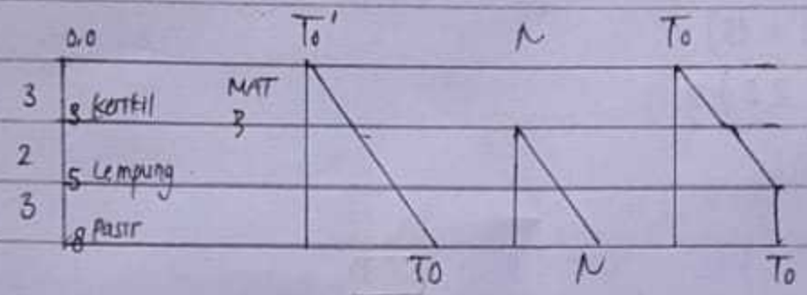
Tugas Kuliah 3

1) Dik : Lapisan 1 kerikil, tebal 3 m (γ_{sat} = 16 kN/m³)
Lapisan 2 lempung, tebal 2 m (γ_{sat} = 19 kN/m³)
Lapisan 3 pasir, tebal 3 m (γ_{sat} = 19 kN/m³)
Muka air di permukaan lempung !

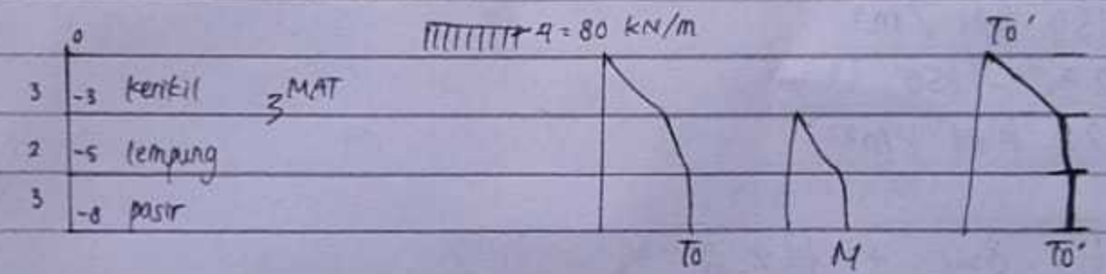
Dit : a) Gambar diagram tekanan total, efektif, dan tekanan air pori
b) Gambar diagram tekanan beban merata 50 kN/m³
c) Gambar diagram tekanan total setelah konsolidasi !

Jawab :

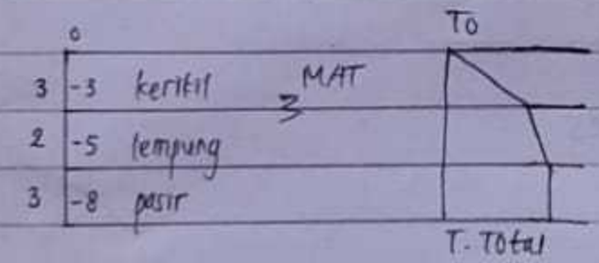
a)



b)



c)



$To = H . \gamma_{sat}$

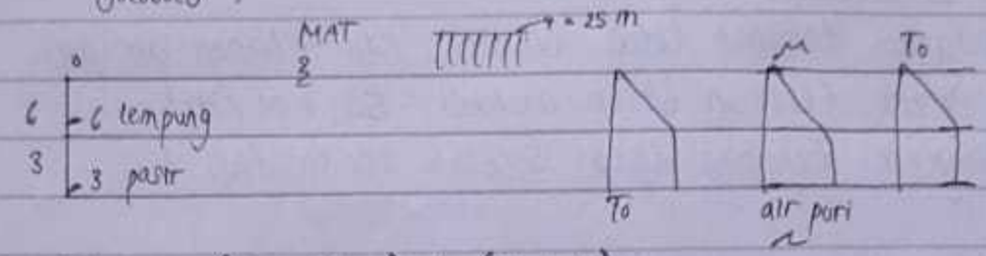
$= 3 . 16$

$= 48$ kN/m³

Soal 2) Dik : Lapisan lempung T = 6 m, γ_{sat} = 21 kN/m³
Lapisan pasir T = 3 m, γ_{sat} = 27 kN/m³
Muka air tanah di tanah
Beban diatas lempung 25 kN/m²

Dit : a) Gambar diagram t. total, efektif, air pori ?

Jawab :



$T_o = (H_1 . \gamma_{sat}) + (q + 15)$
$= (6 . 21) + (6 . 25)$
$= 276 \text{ kN/m}^3$

$M = (H_1 . g)$
$= 6 . 25$
$= 150 \text{ kN/m}^3$

$T_o = 276 - 150$
$= 126 \text{ kN/m}^3$

$T_o = H_2 . \gamma_{sat} + H_2 . g$
$= (3, 2) + (3 . 25)$
$= 138 \text{ kN/m}^3$

$M = (H_2 + H_3) g . (6 + 3) . 25$
$= 225 \text{ kN/m}^3$

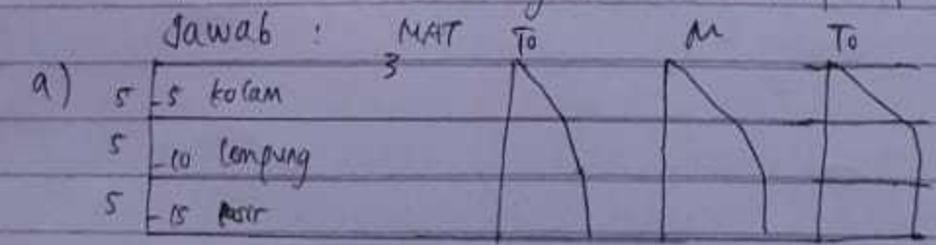
$T_o = 138 - 225$
$= 87 \text{ kN/m}^3$

Soal 3) Dik : Kolam T = 5 m
Lempung T = 5 m, γ_{sat} = 19 kN/m³
Pasir T = 5 m, γ_{sat} = 18 kN/m³

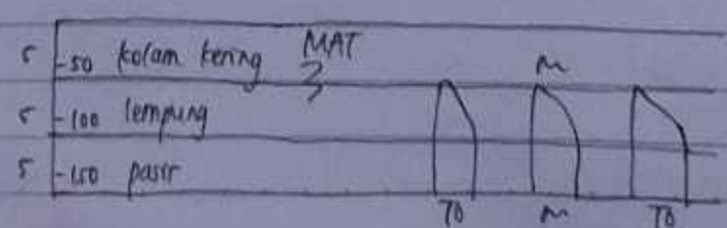
Dit : Gambar diagram t. total, efektif, air pori !

Jawab :

a)



b) Kolam kering

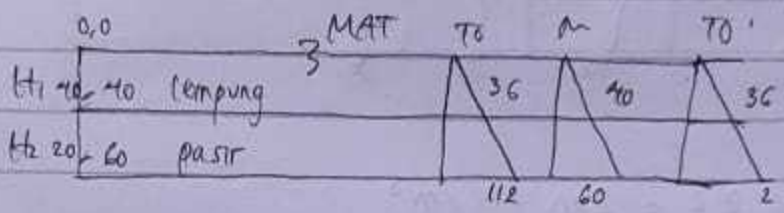


KIKY

Soal 4) Dik : Lempung T = 4 m, γ_{sat} = 19 kN/m³
Pasir T = 2 m, γ_{sat} = 18 kN/m³
Mesometer 2 m diatas tanah
γ_w = 10 kN/m³
- MAT sama dengan tanah

Dit : a) Gambar diagram

Jawab :



* Pada kedalaman 4 m

To = $H_1 . \gamma_{sat}$ = 4.19 = 76 kN/m³

M = $H . \gamma_w$ = 4.10 = 40

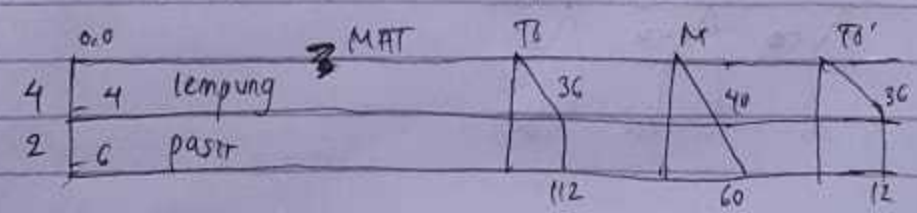
To = To . M = 76 - 40 = 36 kN/m³

* Pada kedalaman 6 m

To = $H_2 . \gamma_{sat}$ + $H_2 . \gamma_{sat}$ = (4.19) + (2.18) =

M = $(H_1 + H_2) \gamma_w$ = 6.10 = 60 kN/m³

To' = To . M = 112 . 60 = 52 kN/m³

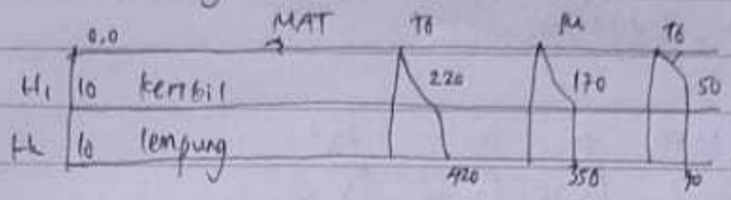


soal 5) Dik : Keriksil T = 10 m, γ_{sat} = 22 kN/m³
Lempung T = 10 m, γ_{sat} = 28 kN/m³
MAT Satna dengan tanah keriksil = 12 kN/m³

Dit : Gambar diagram !

Jawab :

a)



-) Hitungan 10 m :

$T_o = H_1 . \gamma_{sat} = 10 . 22 = 220$ kN/m³

$M = H . Bj = 10 . 17 = 170$ kN/m³

$T_o' = T_o - M = 220 - 170 = 50$ kN/m³

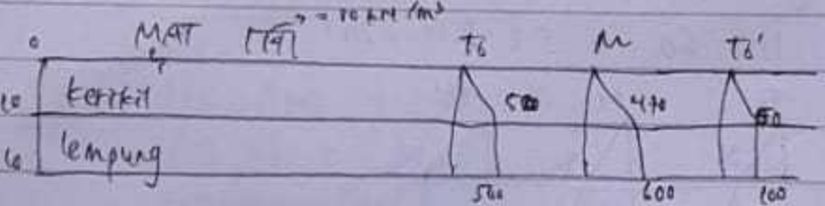
-) Pada 20 m :

$T_o = (H_1 . \gamma_{sat}) + (H_2 . \gamma_{sat}) = (10 . 22) + (10 . 250) = 420$ kN/m

$M = (H_1 + H_2) . \gamma_{sat} = 20 . 17 = 350$ kN/m³

$T_o' = T_o - M = 420 - 350 = 70$ kN/m³

b)



* Hitungan 10 m :

$T_o = (H_1 . \gamma_{sat}) + (H_1 . g) = 10 . 22 + 10 . 70 = 520$ kN/m³

$M = (H . \gamma) + (g . H) = 10 . 17 + 30 . 50 = 470$ kN/m³

$T_o' = T_o - M = 520 - 470 = 50$ kN/m³

* Hitungan 20 m :

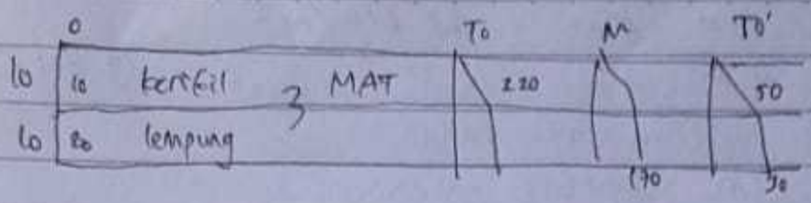
$T_o = (H_2 . \gamma_{sat}) + (H_2 . g) = 10 . 20 + 10 . 30 = 500$ kN/m³

$M = (H_1 + H_2) \gamma = 20 . 30 = 600$ kN/m³

$T_o' = T_o - M = 500 - 600 = 100$ kN/m³

(KKY)

c)



* Hitungan 10 M

$To = H_2 . \gamma_{sat} = 10 . 22 = 220 \text{ kN/m}^3$

$M = H . B_j = 0$

$To' = 50 . M = 220 - 170 = 50 \text{ kN/m}^3$

* Hitungan 30 M

$To = H_2 . \gamma_{sat} = 10 . 20 = 200 \text{ kN/m}^3$

$M = H_2 . B_j = 10 . 17 = 170 \text{ kN/m}^3$

$To' = To . M = 200 - 170 = 30 \text{ kN/m}^3$

Soal 6) Dik : Pasir T = 5 m ; γ_{sat} = 19 kN/m³ ; γ_w = 16

Lempung T = 6 M ; γ_{sat} = 20 kN/m³

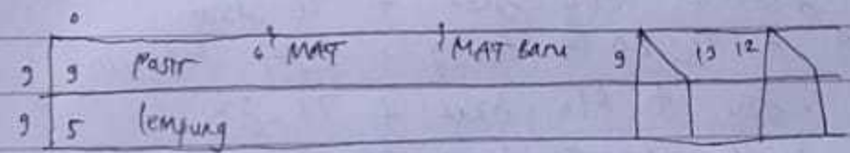
MAT 6 m dari permukaan tanah

MAT naik 2 M dari permukaan tanah

Dit : a) Tentukan tekanan efektif 8 m . 12 m dibawah tanah.

Jawab :

a)



$To' = (t_1 - \gamma_w) + (8-3) . \gamma_{sat} = (3.19) + (5.19) = 152 \text{ kN/m}$

$M = (H_1 - 3) . \gamma_w = (8-3) . 16 = 80 \text{ kN/m}^3$

$To = 152 - 80 = 72 \text{ kN/m}^3$

$To' = To = H_1 . \gamma_{sat} + (H-3) . \gamma_{sat} + (12-9) = 220 \text{ kN/m}$

$M = (12-3) . \gamma_{sat} = 9 . 20 = 180 \text{ kN/m}^3$

$To' = 228 - 180 = 48 \text{ kN/m}^3$

kedalaman retakan :

$$hc = \frac{2c}{\gamma b \sqrt{Ka}} = \frac{2(10)}{19,2\ 0,84} = 1,24\ m$$

Tekanan tanah aktif total

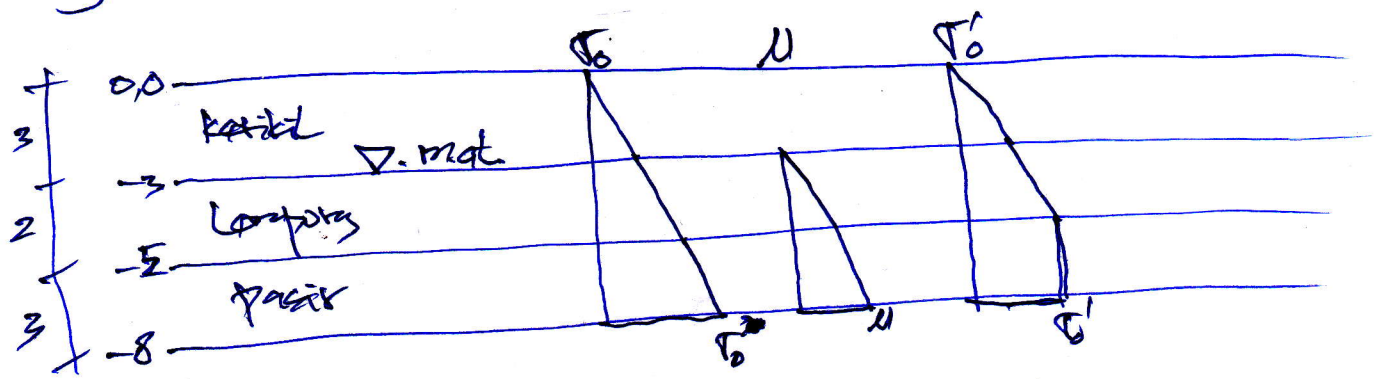
$$Pa = \frac{1}{2} (104,16)(9-1,24)$$
$$= 404,19\ kN/m$$

Titik Tangkap = $(9-1,24)/3$
= 2,58 dari dasar dinding.

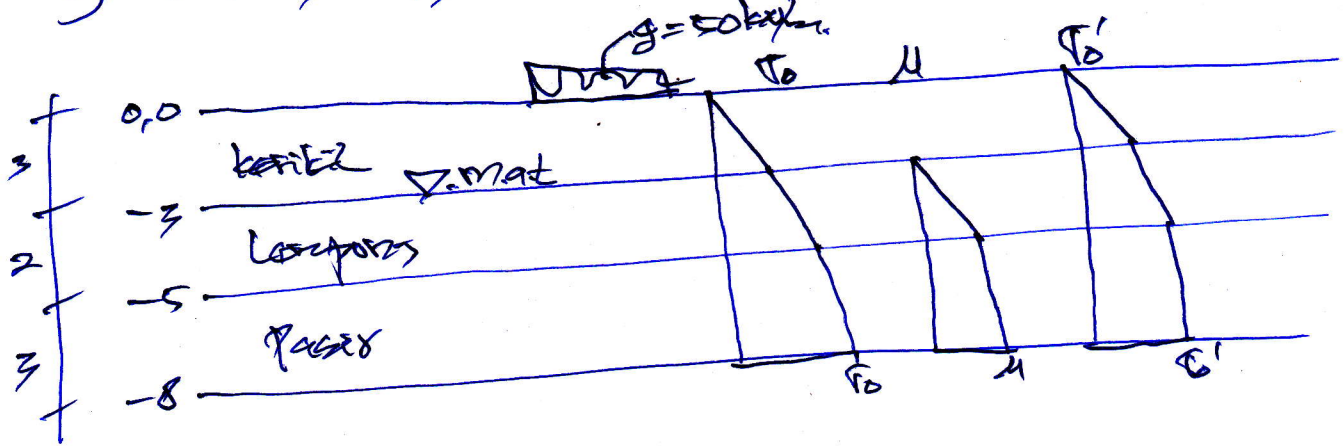
Tugas - 3 . Nofriandi fitri

Soal. 1. - Lapis I kerikil $t = 3$ m . $\gamma_{sat} = 16$ kN/m³
- 2 Lempung $t = 2$ m . $\gamma_{sat} = 15$ kN/m³
- 3. pasir $t = 3$ m . $\gamma_{sat} = 19$
- M.a.t pd tanah lempung

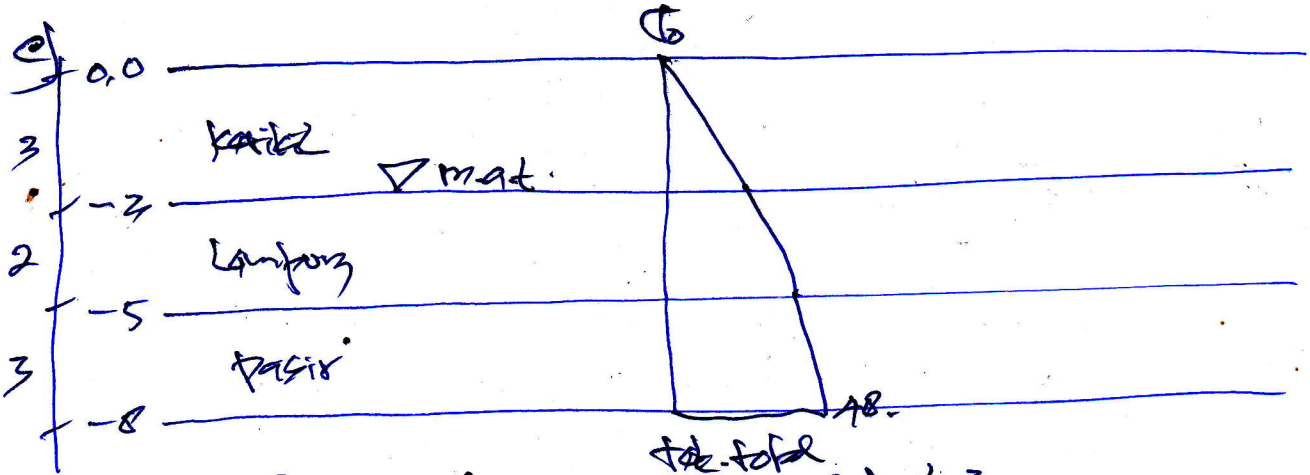
a). Gbr diagram tegangan total, uf, air pori



b) Gbr diagram tegangan + beban merata 50 kN/m²



c)

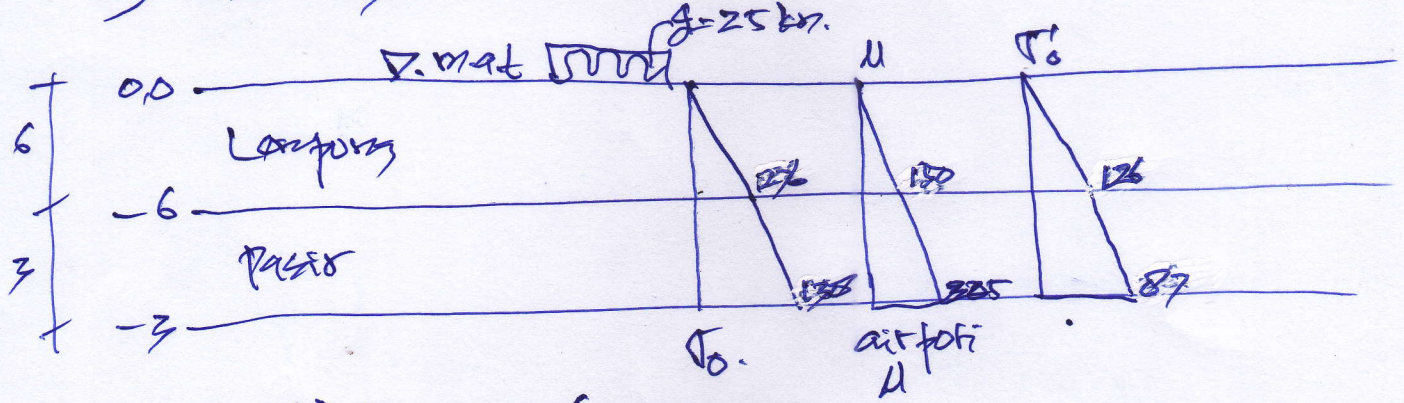


$\sigma_0 = H_1 . \gamma_{sat} = 3 . 16 = 48$ kN/m².

Soal. 2.

- Lapisan lempung $t = 6$ m. $\gamma_{sat} = 21$ kN/m³
- Lapisan pasir $t = 3$ m. $\gamma_{sat} = 22$ kN/m³
- M.A.T di permukaan tanah
- diatas lempung ada beban merata. 25 kN/m².
- Umpama $\gamma_w = 10$ kN/m³

a) Gbr diagram Tek. total, eff, air pori



Kedalaman -6,0 m.

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (q \cdot H_1) = (6 \cdot 21) + (6 \cdot 25) = 276$ kN/m²

$u = (H_1 \cdot \gamma_w) = 6 \cdot 25 = 150$ kN/m²

$\sigma'_o = 276 - 150 = 126$ kN/m²

Kedalaman

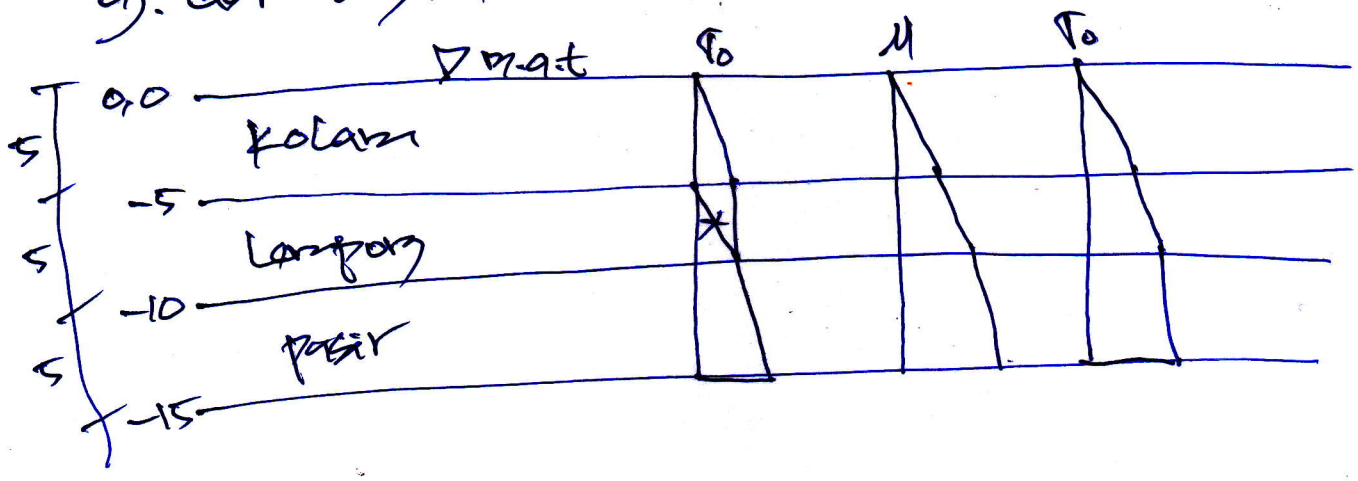
$\sigma_o = H_2 \cdot \gamma_{sat} + H_1 \cdot \gamma = (3 \cdot 21) + (3 \cdot 25) = 138$ kN/m²

$u = (H_2 + H_1) \cdot \gamma = (6+3) \cdot 25 = 225$ kN/m²

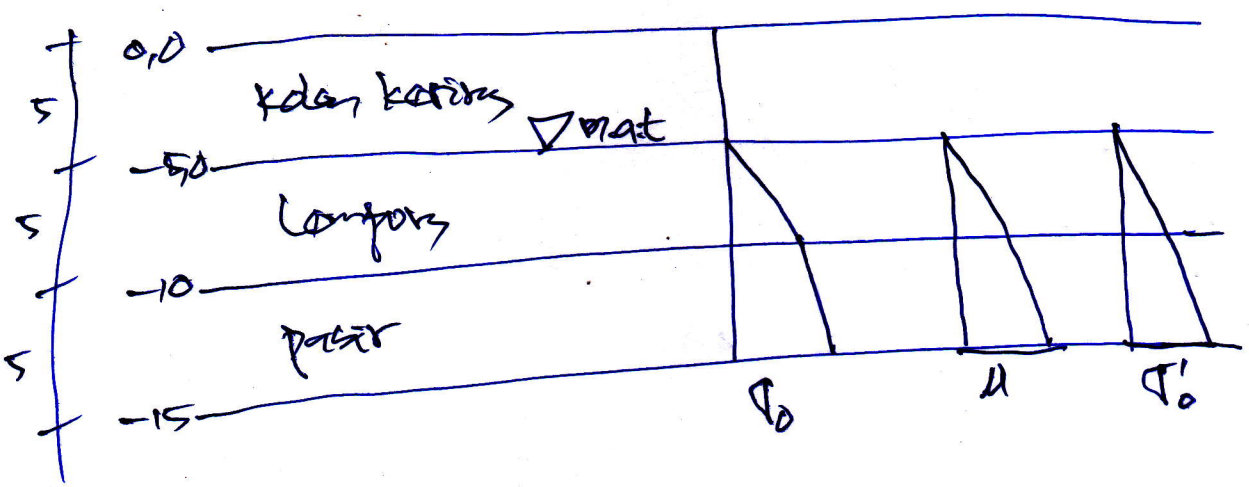
$\sigma'_o = 138 - 225 = 87$ kN/m²

Soal.3 - Kolam dalam 5 m.
- Lapisan Lempung t=5 m. γ_{sat} = 19 kN/m³
- ---- Pasir t = 5 m. γ_{sat} = 18 kN/m³

a). Gbr diagram Tek. total, eff. air pori



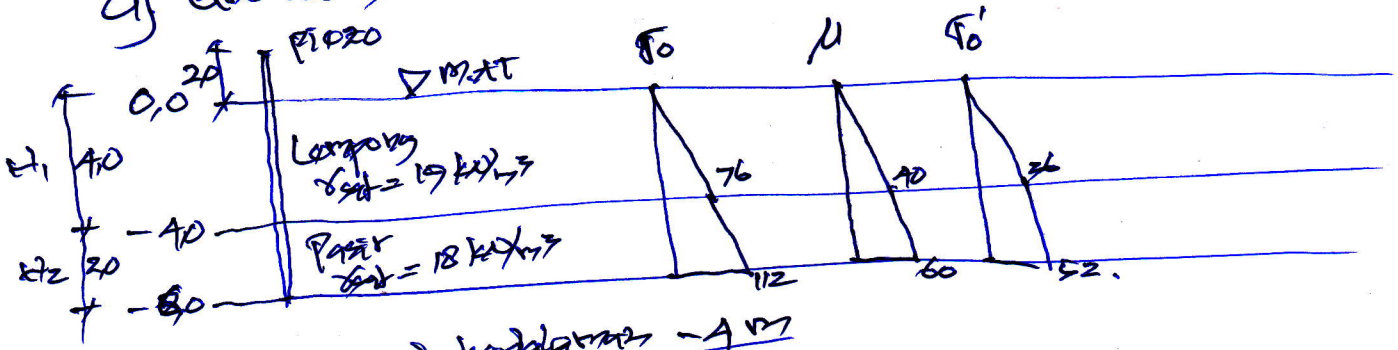
b). Gbr diagram, kolam di keringkan



Soal 4.

- Lempung $t = 4$ m . $\gamma_{sat} = 19$ kN/m³
- Pasir $t = 2$ m . $\gamma_{sat} = 18$ kN/m³
- Piezometer 2 m diatas tanah
- $\gamma_w = 10$ kN/m³ (asumsi)
- MAT sejajar muka tanah.

a) Gbr diagram T. total, T. eff, air pori



Hitung pd kedalaman -4 m

$T_0 = t_1 \cdot \gamma_{sat} = 4 \cdot 19 = 76$ kN/m³

$U = t_1 \cdot \gamma_w = 4 \cdot 10 = 40$

$T_0' = T_0 - U = 76 - 40 = 36$ kN/m².

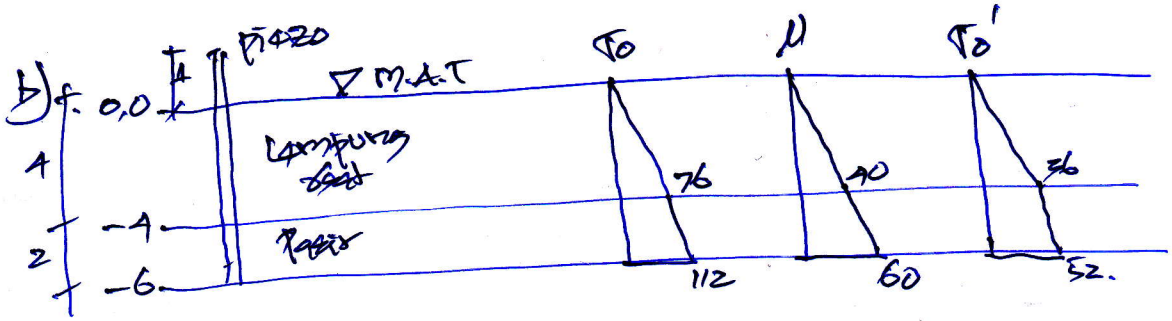
Hitungan pd kedalaman -6 m

$T_0 = t_1 \cdot \gamma_{sat} + t_2 \cdot \gamma_{sat} = (4 \cdot 19) + (2 \times 18) = 112$ kN/m²

$U = (t_1 + t_2) \cdot \gamma_w = 6 \cdot 10 = 60$ kN/m²

$T_0' = T_0 - U = 112 - 60 = 52$ kN/m²

b)

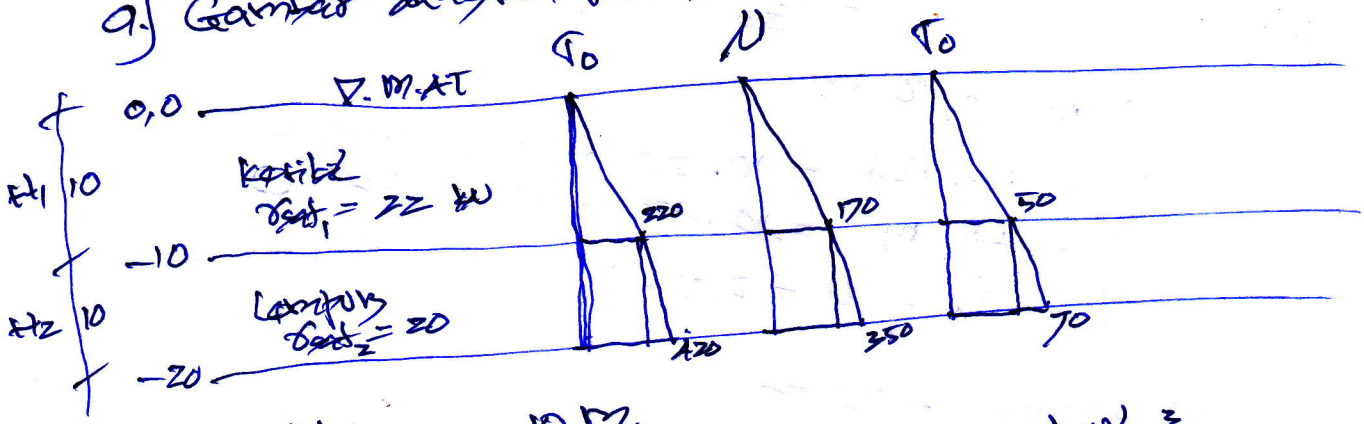


Hasil hitungan sama.

Soal.5

- Lapisan kerikil $t = 10$ m, $\gamma_{sat} = 22$ kN/m³
- Lapisan lempung $t = 10$ m, $\gamma_{sat} = 20$ kN/m³
- M.A.T sama muka tanah
- γ_j kerikil = 17 kN/m³.

a) Gambar diagram total, eff, dan pori



Hitungan – 10 m.

$\sigma_o = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220$ kN/m²

$u = H_1 \cdot \gamma_j = 10 \cdot 17 = 170$ kN/m².

$\sigma_o' = \sigma_o - u = 220 - 170 = 50$ kN/m²

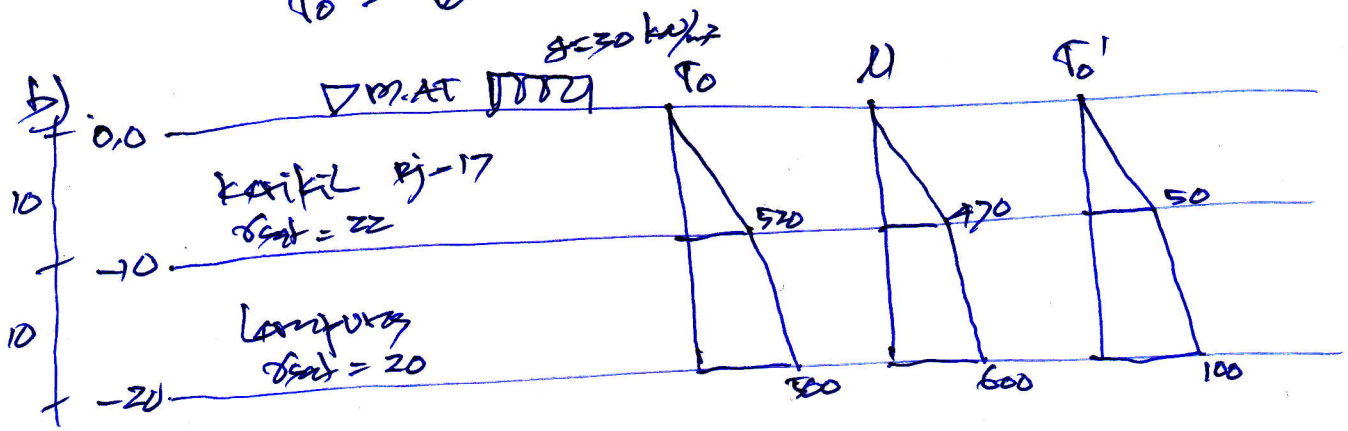
Hitungan – 20 m

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (H_2 \cdot \gamma_{sat}) = (10 \cdot 22) + (10 \cdot 20) = 420$ kN/m²

$u = (H_1 + H_2) \cdot \gamma_w = 20 \times 17 = 350$ kN/m²

$\sigma_o' = \sigma_o - u = 420 - 350 = 70$ kN/m².

b)



Hitungan – 10 m.

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (H_1 \cdot q) = (10 \cdot 22) + (10 \cdot 30) = 520$ kN/m²

$u = (H_1 \cdot \gamma_j) + (q \cdot H_1) = (10 \cdot 17) + (30 \cdot 10) = 470$ kN/m²

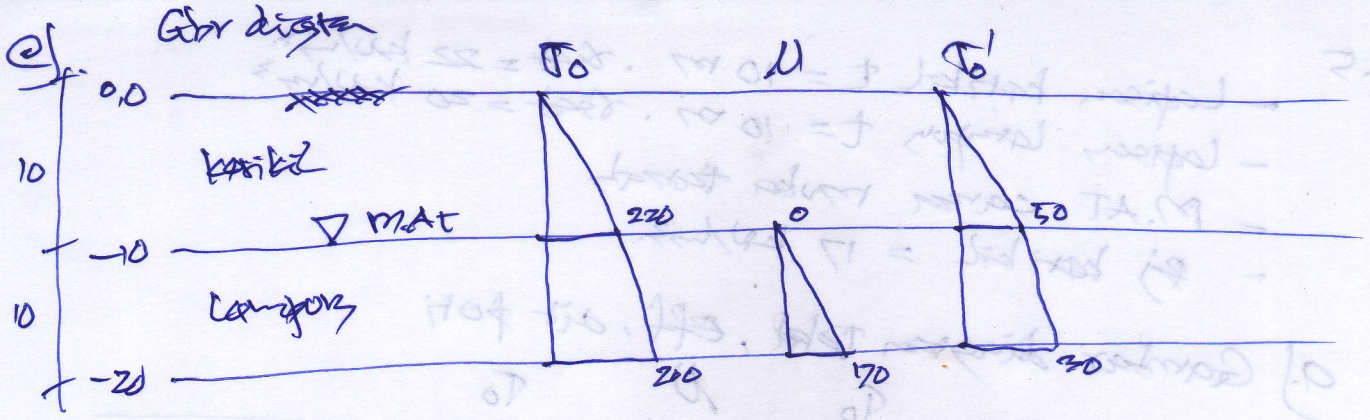
$\sigma_o' = \sigma_o - u = 520 - 470 = 50$ kN/m²

Hitung – 20

$\sigma_o = (H_2 \cdot \gamma_{sat}) + (H_2 \cdot q) = (10 \cdot 20) + (10 \cdot 30) = 500$ kN/m²

$u = (H_1 + H_2) \cdot q = 20 \cdot 30 = 600$ kN/m²

$\sigma_o' = \sigma_o - u = 500 - 600 = 100$



ketinggian −10 m

$\sigma_o = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220$ kN/m²

$u = H_1 \cdot \gamma_w = 10 \cdot 17 = 170$ kN/m²

$\sigma'_o = \sigma_o - u = 220 - 170 = 50$ kN/m²

ketinggian −20 m

$\sigma_o = H_2 \cdot \gamma_{sat} = 10 \cdot 20 = 200$ kN/m²

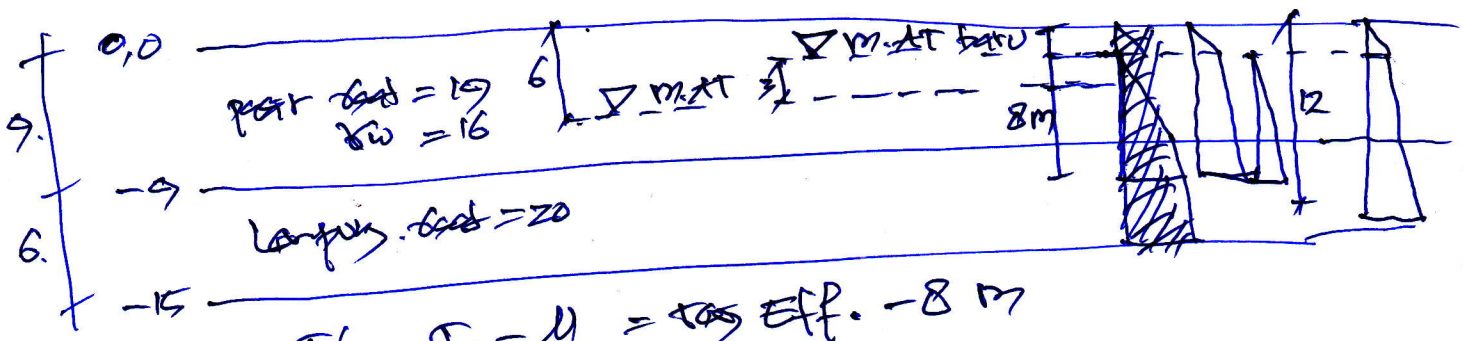
$u = H_2 \cdot \gamma_w = 10 \cdot 17 = 170$ kN/m²

$\sigma'_o = \sigma_o - u = 200 - 170 = 30$ kN/m²

Soal 6.

- Lapisan pasir $t = 9$ m. $\gamma_{sat} = 19$ kN/m³, $\gamma_w = 16$
- Lapisan lempung $t = 6$ m. $\gamma_{sat} = 20$ kN/m³
- MAT Laut 6 m dr permukaan tanah
- MAT Baru naik 3 m yg baru

a.) Tentukan Tek. eff pd kedalaman 8 dan 12 m di bawah permukaan tanah, apabila setelah kenaikan m.a.t



$\sigma_o' = \sigma_o - u$ = tek. Eff. − 8 m

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (8-3)\cdot\gamma_{sat} = (3 \cdot 19) + (5 \cdot 19) = 152$ kN/m²

$u = (H_1 - 3) \cdot \gamma_w = (8-3) \cdot 16 = 80$ kN/m²

$\sigma_o = 152 - 80 = 72$ kN/m².

$\sigma_o' = \sigma_o - u$ = tek eff − 12 m.

$\sigma_o = H_1 \cdot \gamma_{sat} + (H_2 - 3) \cdot \gamma_{sat} + (12-9) \cdot \gamma_{sat}$

$= 3 \cdot 19 + (9-3) \cdot 19 + (3 \cdot 19) = 228$ kN/m²

$u = (12-3) \cdot \gamma_{sat} 20 = 9 \cdot 20 = 180$ kN/m²

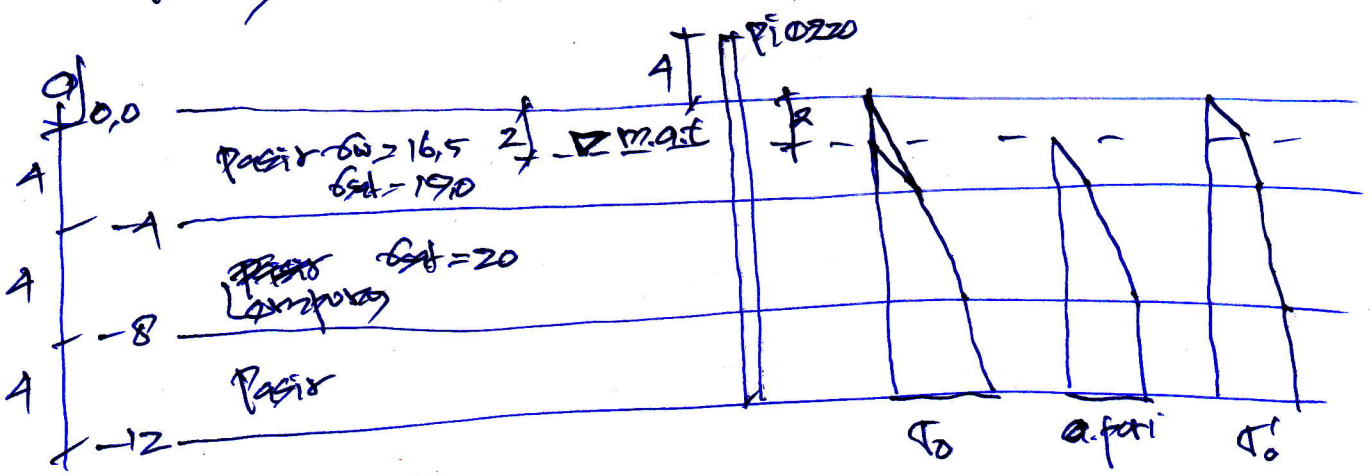
$\sigma_o' = 228 - 180 = 48$ kN/m².

b.) Berapa tahun penurunan terjadi m.a.t.

Soal 7 - Lempung $t = 4$ m. $\gamma_{sat} = 20$ kN/m³

- Pasir $t = 4$ m. $\gamma_w = 16{,}5$, $\gamma_{sat} = 19$ kN/m³
- M.A.T. = 2 m di bawah permukaan tanah.
- m.a.t. piezo = 4 m di atas permukaan tanah.

Hitung. Tek. Eff diatas dan di bawah lapisan pasir



$\sigma'_o = \sigma_o - u$. Tek. Eff di atas pasir

$\sigma_o = (H_1 - 2) \cdot \gamma_{sat} + (H_1 - 2) \cdot \gamma_{sat}$

$= (4-2) \cdot 19 + (4-2) \cdot 19$

$= 76$ kN/m²

$u = (H_1 - 2)\, \gamma_w = (4-2) \cdot 16{,}5 = 33$ kN/m²

$= \sigma'_o - u = 76 - 33 = 43$ kN/m².

$\sigma'_o = \sigma_o - u$. Tek. eff di bawah pasir

$\sigma_o = (H_1 - 2) \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat}$

$= 4-2 \cdot 19 + 4 \cdot 20 + 4 \cdot 19$

$= 194$ kN/m²

$u = (H_1 - 2) \cdot \gamma_w + H_2 \cdot \gamma_w + H_2 \cdot \gamma_w$

$= 2 \cdot 16{,}5 + 4 \cdot 16{,}5 + 4 \cdot 16{,}5$

$= 165$ kN/m²

$\sigma'_o = 194 - 165 = 29$ kN/m².

NAMA : RICO ANDRA BELLI
NPM : 182710042.

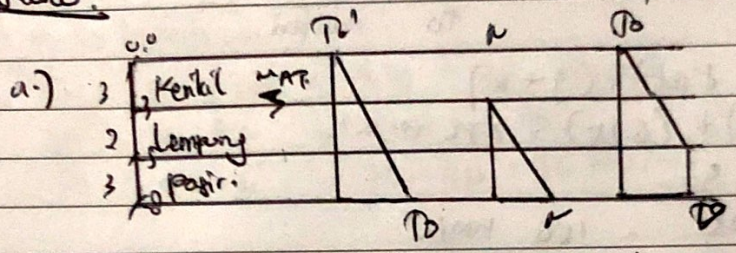
Tugas Kuliah 3.

1.) Dik : Lapisan 1. Kerikil tebal 3 m (γ = 16 KN/m³).
Lapisan 2. Lempung 2 m (γ_{sat} = 19 KN/m³).
Lapisan 3. Pasir 3 m (γ_{sat} = 19 KN/m³)
Muka air di permukaan lempung !

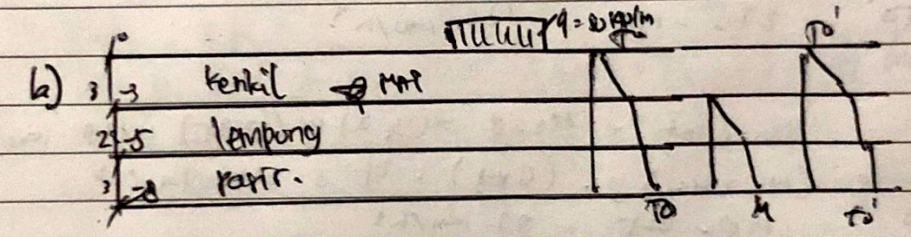
Dit : a.) Gambar diagram tek. total, Efektif, dan tek. air pori
b.) Gambar diagram bila beban merata. 50 KN/m².
c.) Gambar dg-gram. tek. total setelah konsolidasi !

Jawab :

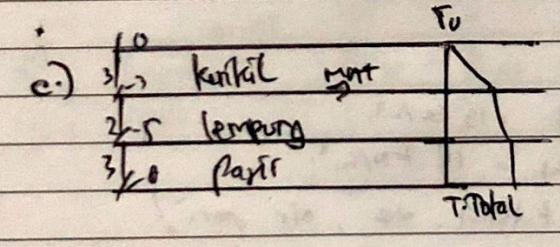
a.)



b.)



c.)



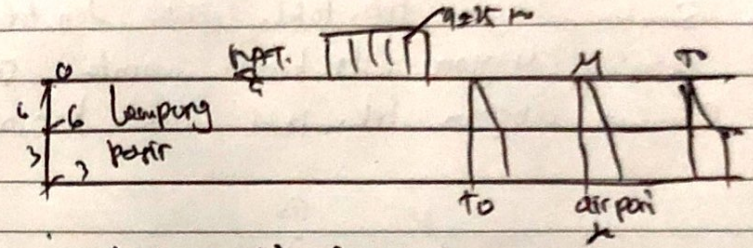
TD = H. γ_{sat}.
= 3 . 10
= 40 kn/m².

No.
Date

Soal 2.) Dik: • Lapisan lempung T = 6m, γsat = 21 kN/m³.
• Lapisan pasir T = 3 m, γsat = 27 kN/m³.
• Muka air tanah di tanah.
• Beban merata lempung 25 kN/m².

Dit.) a. Gambar diagram t. total, eff. air pori?

Jawab:



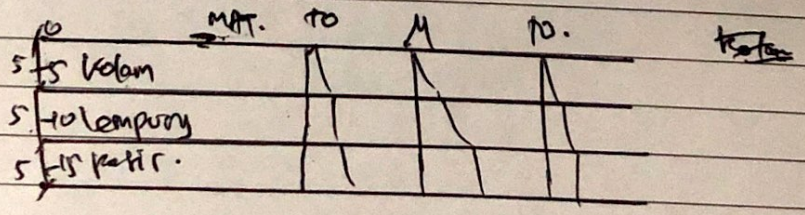
• TO = (H1 . γsat) + (q + w)
= (6.21) + (6.25) = 276 kN/m².
M = (H1 . γ)
= 6.25 = 150 kN/m².
T'O = 276 - 150 = 126 kN/m²

b) TO = H2 . γsat + H2 . γ = (3.2) + (3.25) = 130 kN/m².
M = (H2 + H3) γ = (6+3) . 25 = 225 kN/m²
T'O = 130 - 225 = -97 kN/m².

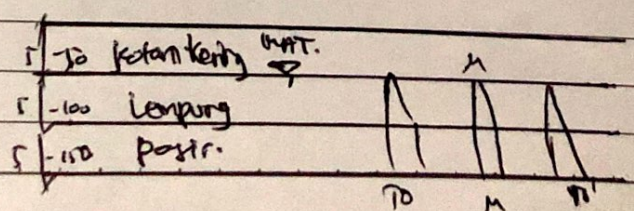
Soal 3) Dik: • kolam T = 5 m.
• lempung T. 5 m, γsat = 19 kN/m³.
• pasir T. 5 m, γsat = 18 kN/m³.
Dit: Gambar diagram t. total, eff, air pori?

Jawab:

a)



b.) kolam kering.

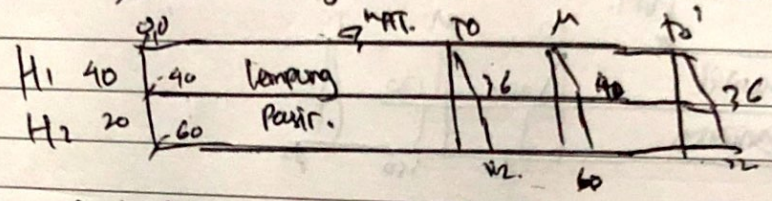


VOS HL-102B 6ミリ x 36行

No.
Date

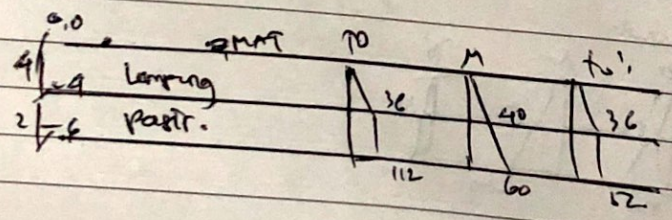
Soal 4) Dik : lempung T. 4m, $\gamma_{sat} = 19\ kN/m^3$.
pasir T. 2m, $\gamma_{sat} = 18\ kN/m^3$.
Piezometer 2m di atas tanah.
$\gamma_w = 10\ kN/m^3$ (
-MAT sama dgn tanah.

Dit : a) Gambar diagram.



-) Pada kedalaman 4m :
$T_O = H_1 \cdot \gamma_{sat} = 4 \cdot 19 = 76\ kN/m^2$
$M = H_1 \cdot \gamma_w = 4 \cdot 10 = 40$
$T_O' = T_O - M = 76 - 40 = 36\ kN/m^2$

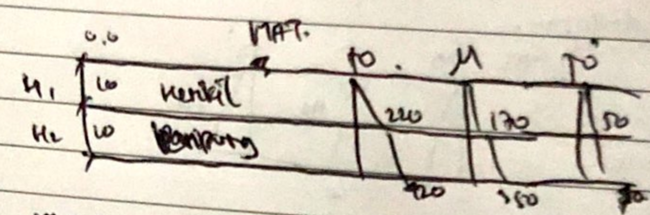
-) Pada 6m :
$T_O = H_2 \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat} = (4 \times 19) + (2 \times 18) = 112\ kN/m^2$.
$M = (H_1 + H_2)\gamma_w = 6 \cdot 10 = 60\ kN/m^2$.
$T_O' = T_O - M = 112 - 60 = 52\ kN/m^2$.



No.
Date

Soal 5.) Dik : kerikil $t = 10$ m , $\gamma_{sat} = 22$ kN/m².
Lempung $t = 10$ m , $\gamma_{sat} = 20$ kN/m².
M.AT sama dg tanah
Bj kerikil = 17 kN/m².
Dit : gambar diagram !

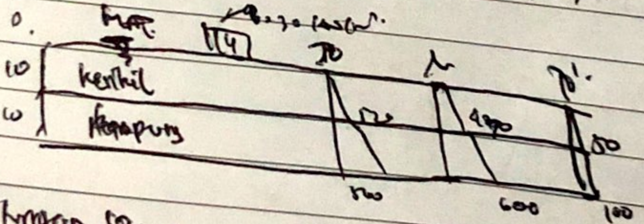
Jawab :
a)



→ Hitungan 10 m :
To : $H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220$ kN/m².
M $= H_1 \cdot Bj = 10 \cdot 17 = 170$ kN/m².
To' $= To - M = 220 - 170 = 50$ kN/m².

→ pada 20 m :
To $= (H_1 \cdot \gamma_{sat}) + (H_2 \cdot \gamma_{sat}) = (10 \cdot 22) + (10 \cdot 20) = 420$ kN/m².
M $= (H_1 + H_2) \cdot \gamma_w = 20 \times 17 = 350$ kN/m².
To' $= To - M = 420 - 350 = 70$ kN/m².

b.)

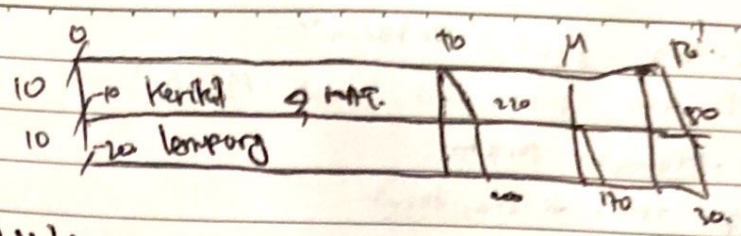


→ Hitungan 10 m :
To $= (H_1 \cdot \gamma_{sat}) + (H_1 \cdot g) = 10 \cdot 22 + 10 \cdot 30 = 520$ kN/m²
M $= (H_1 \cdot \gamma) + (g \cdot H_1) = 10 \cdot 17 + 30 \cdot 10 = 470$ kN/m².
To' $= To - M = 520 - 470 = 50$ kN/m².

→ Hitungan 20 m :
To $= (H_2 \cdot \gamma_{sat}) + (H_2 \cdot g) = 10 \cdot 20 + 10 \cdot 30 = 500$ kN/m².
M $= (H_1 + H_2) g = 20 \cdot 30 = 600$ kN/m²
To' $= To - M = 500 - 600 = 100$ kN/m².

VOS HL-102B 6ミリ x 36行

e.)



*) Hitungan 10 M.

$To = H_1 \cdot \gamma sat = 10 \cdot 22 = 220$ kN/m²

$M = H_1 \cdot \gamma_j = 0$

$To' = To - M = 220 - 170 = 50$ kN/m²

*) Hitungan 20 m.

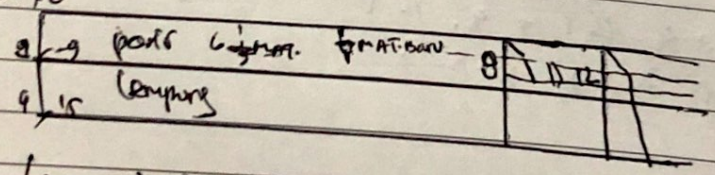
$To = H_2 \cdot \gamma sat = 10 \cdot 20 = 200$ kN/m²

$M = H_2 \cdot \gamma_j = 10 \cdot 17 = 170$ kN/m²

$To' = To - M = 200 - 170 = 30$ kN/m²

6.) Dik: pasir T. 5m ; $\gamma sat = 19$ kN/m³ ; $\gamma w = 10$.
Lempung T. 6m ; $\gamma sat = 20$ kN/m³.
MAT 6m dr permukaan tanah.
MAT. naik 3m dari
Dit: a) Tent. Tek. eff. di m n m di bawah tanah.

a)



$To' = (H_1 - \gamma w) + (2 - 3) \cdot \gamma sat = (3 \cdot 19) + (1 \cdot 19) = 152$ kN/m².

$M = (H_1 - 3) \cdot \gamma w + (8 - 3) \cdot 16 = 80$ kN/m².

$To = 152 - 80 = 72$ kN/m².

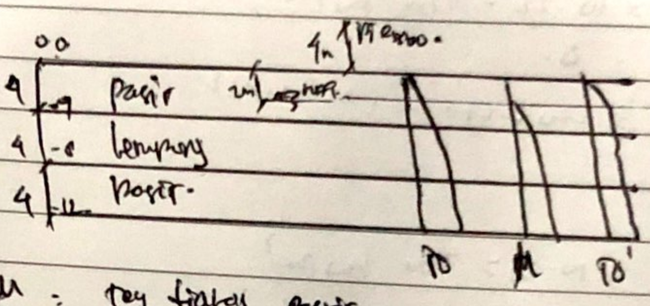
$To' = To = H_1 \cdot \gamma sat + (H_2 - 3) \cdot \gamma sat + (2 - 9) = 220$ kN/m².

$M = (12 - 3) \cdot \gamma sat = 9 \cdot 20 = 180$ kN/m².

$To' = 188 - 180 = 48$ kN/m²

soal (7) Dik: lempung T. 4m . γ_{sat} = 20 kN/m²
pasir T. 4m γ_w = 16.5 , γ_{sat} · 19 kN/m²
MAT. 2m . dibawah tanah
MAT. Piezo 4m . di atas tanah
Dit: tek. efektif diatas & bawah pasir

Jawab:



σ' = σ - μ = teg diatas pasir.

$\sigma = (H_1 - 2) \cdot \gamma_{sat} + (H_1 - 2) \cdot \gamma_{sat}$.
$= (4-2) \cdot 19 + (4-2) \cdot 19 = 76$ kN/m².
$\mu = (H_1 - 2) \cdot \gamma_w = (4-2) \cdot 16.5 = 33$ kN/m².
$\sigma' = \sigma' - \mu = 76 - 33 = 43$ kN/m²

σ' = σ - μ . teg di bawah pasir.
$\sigma = (H_1 - 2) \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat} + H_3 \cdot \gamma_{sat}$
$= 4 - 2 \cdot 19 + 4 \cdot 20 + 4 \cdot 19 = 194$ kN/m².
$\mu = (H_1 - 2) \cdot \gamma_w + H_2 \cdot \gamma_w + H_3 \cdot \gamma_w$.
$= 2 \cdot 16.5 + 4 \cdot 16.5 + 4 \cdot 16.5 = 165$ kN/m²
$\sigma' = 194 - 165 = 29$ kN/m².

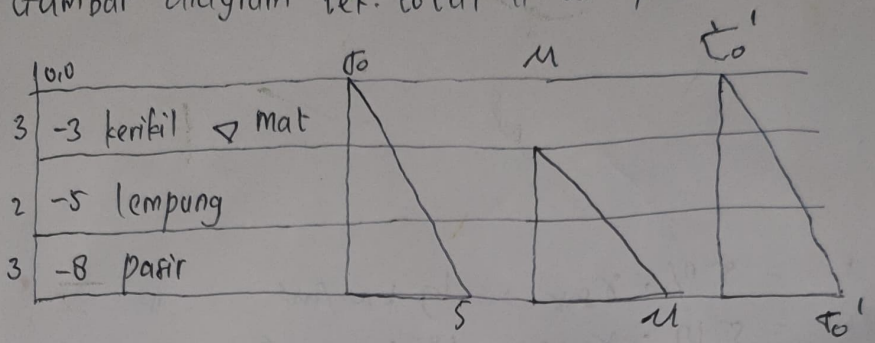
Tugas 3

Nama : Shafta Aclynata
NIM : 182710038

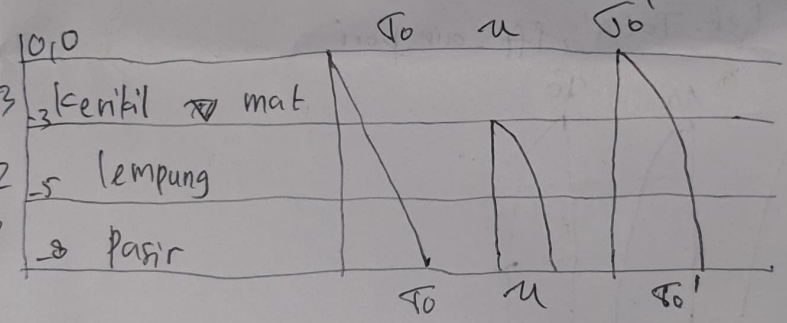
Soal I

Lapican 1 kerikil $t = 3M$, $\gamma_{sat} = 16\ kN/m^3$
Lapis 2 Lempung $t = 2M$, $\gamma_{sat} = 19\ kN/m^3$
Lapis 3 pasir $t = 3M$, $\gamma_{sat} = 14\ kN/m^3$
Mat pada tanah lempung

a./ Gambar diagram tek. total U. air pori



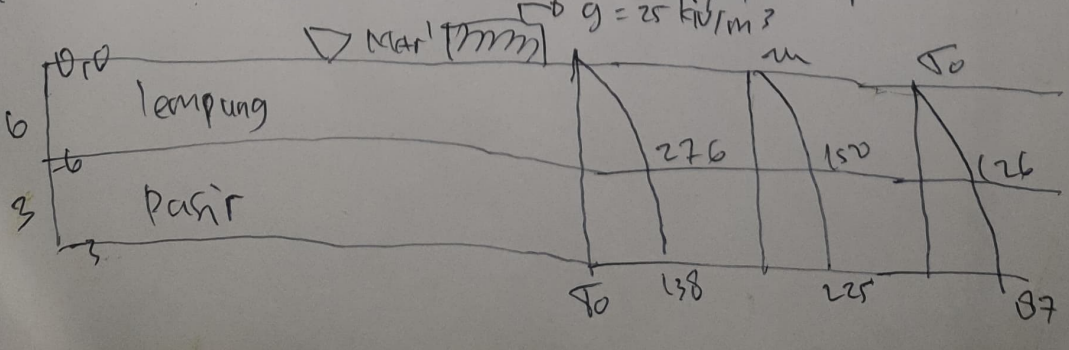
b./ Gambar diagram yang sama + beban merata 50 kN/m^3



Soal 2

Lapisan lempung $t = 6m$, $\gamma_{sat} = 21\ kN/m^3$
Lapisan pasir $t = 3m$, $\gamma_{sat} = 22\ kN/m^3$
MAT di permukaan tanah
Diatas lempung ada beban merata $25\ kN/m^3$

a./ Gambar diagram tek. Total, eff, air pori



Hitung -6,0 m

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (g \cdot H_1) = (6.21) + (6.25) = 276\ kn/m^3$

$u = (H_1 \cdot g) = 6.25 = 150\ kN/m^3$

$\sigma_o' = 276 - 150 = 126\ kN/m^3$

Hitungan

$\sigma_o = H_2 \cdot \gamma_{sat} + H_2 \cdot g = (3.2) + (3.25) = 138\ kN/m^3$

$u = (H_2 + H_2') \cdot g = (6+3) \cdot 25 = 225\ kN/m^3$

$\sigma_o' = 138 - 225 = 87\ kN/m^2$

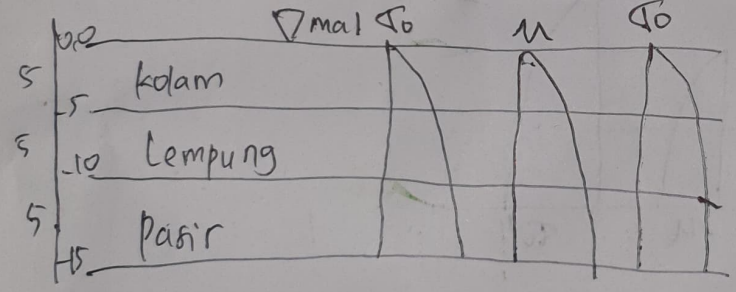
Soal 3

kolam dalam 5 m

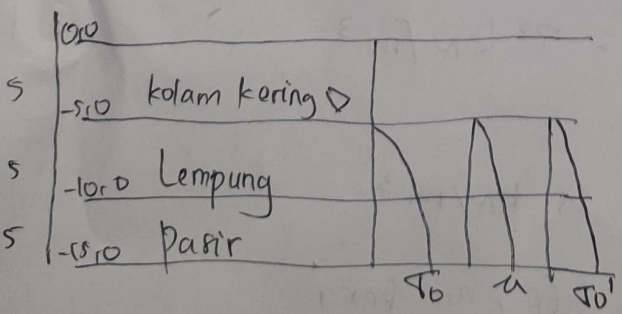
Lapisan lempung t = 5 m, γ_{sat} = 19 kN/m³

Lapisan pasir t = 5 m, γ_{sat} = 18 kN/m³

a./ Gambarlah diagram tek. Total, tek. air pori



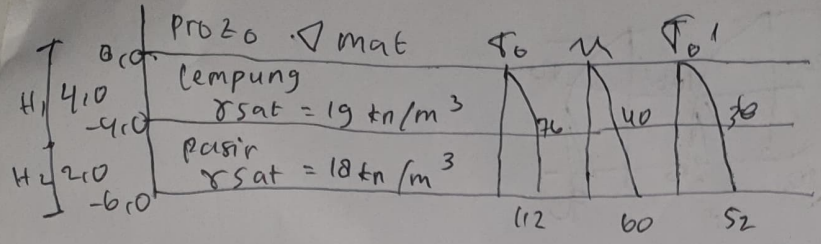
b./ Gambar diagram, kolam dikeringkan



Soal 4

Lapisan lempung t = 4m
Lapisan pasir t = 2m
pd 70 kN/m² 2m di am tanah
$\gamma_w = 10\ kn/m^3$
Mat sama dengan muka tanah.

a/ Gambar diagram tek. total, T.eff, air pori



Hitung pada kedalaman -4 m

$\sigma_o = H_1 \cdot \gamma sat = 4 \cdot 19 = 76\ kn/m^3$

$u = H_1 \cdot \gamma_w = 4 \cdot 10 = 40$

$\sigma_o' = \sigma_o - u = 76 - 40 = 36\ kn/m^3$

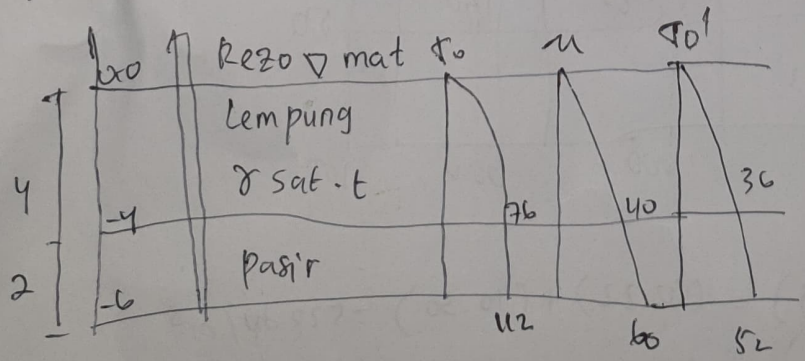
Hitung pada kedalaman -6 m

$\sigma_o = H_1 \cdot \gamma sat + H_2 \cdot \gamma sat = (4 \cdot 19) + (2 \cdot 18) = 112\ kN/m^3$

$u = (H_1 + H_2) \cdot \gamma_w = 6 \cdot 10 = 60\ kN/m^3$

$\sigma_o' = \sigma_o - u = 112 - 60 = 52\ kn/m^3$

b/ Gambar



Ket: Hitungannya sama.

Soal 5

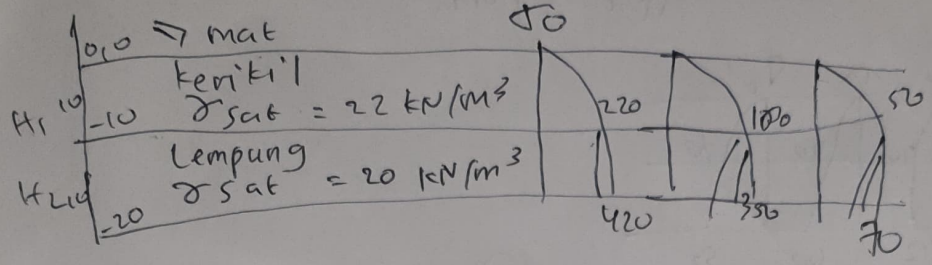
Lapisan kerikil $t = 10\ m$; $\gamma_{sat} = 22\ kN/m^3$

lapisan lempung $t = 10\ m$; $\gamma_{sat} = 20\ kN/m^3$

M. AT sama dengan muka tanah

BJ kerikil $= 17\ kN/m^3$

a./ Gambar Diagram tek. total, Eff air pori



Hitung -10 M

$\sigma_o = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220\ kN/m^3$

$u = H_1 \cdot BJ = 10 \cdot 17 = 170\ kN/m^3$

$\sigma_o' = \sigma_o - u = 220 - 170 = 50\ kN/m^3$

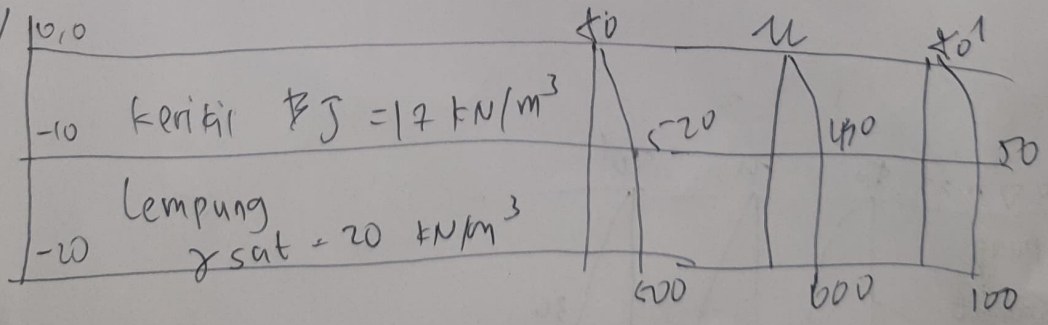
Hitung -20 M

$\sigma_o = (H_2 \cdot \gamma_{sat}) + (H_2 \cdot \gamma_{sat}) = (10 \cdot 22) + (10 + 20) = 420\ kN/m^3$

$u = (H_1 + H_2)\ \gamma_w = 20 \times 17 = 350\ kN/m^3$

$\sigma_o' = \sigma_o - u = 420 - 350 = 70\ kN/m^3$

b./



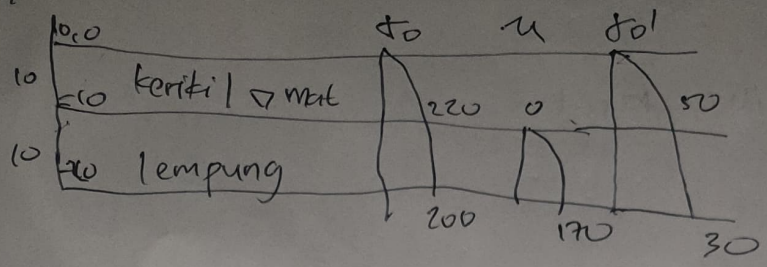
Hitung -10 M

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (H_1 \cdot g) = (10 \cdot 22) + (10 \cdot 30) = 520\ kN/m^3$

$u = (H_1 \cdot BJ) + (g \cdot H_1) = (10 \cdot 17) + (30 10) = 470\ kN/m^3$.

$\sigma_o' = \sigma_o - u = 520 - 470$

c-/ Gambar diagram



Hitung -10 M

$\sigma_o = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220$ kN/m3

$u = H_1 \cdot B_J = 0$ kN/m3

$\sigma_o' = \sigma_o - u = 220 - 170 = 50$ kN/m3

Hitung -20 M

$\sigma_o = H_2 \cdot \gamma_{sat} = 10 \cdot 20 = 200$ kN/m3

$u = H_2 \cdot B_J = 10 \cdot 17 = 170$ kN/m3

$\sigma_o' = \sigma_o - u = 220 - 170 = 30$ kN/m3

Soal 6

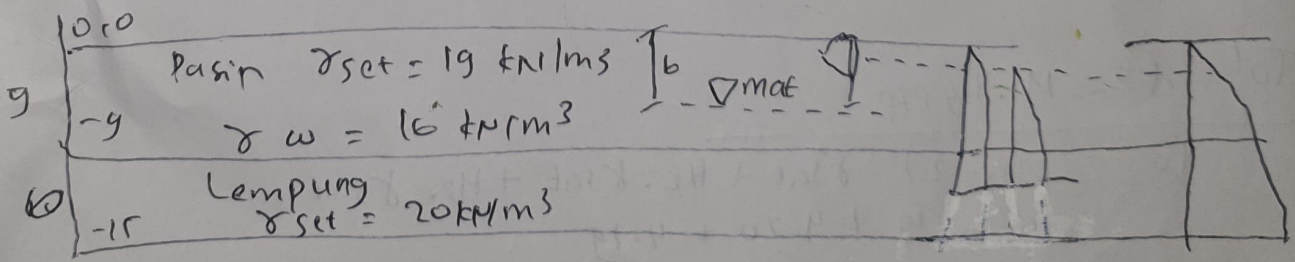
Lapis pasir $b = 9$ M, $\gamma_{sat} = 19$ kN/m3

lapis lempung $b = 6$ M, $\gamma_{sat} = 20$ kN/M3

Mat letak 6 m dari permukaan tanah

Mat pentah 3 M

a-/ Tentukan tek. eff pada kedalaman 8 dan 12 M dibawah permukaan tanah.



$\sigma_o' = \sigma_o - u$ = reg EFF -BM

$\sigma_o = (H_1 \cdot \gamma_w) + (8-3) \cdot \gamma_{sat} = (3 \cdot 19) + (5 \cdot 19) = 152$ kN/m3

$u = (H_1 - 3) \cdot \gamma_m = (8 \cdot 3) 16 = 80$ kN/m3

$\sigma_o' = \sigma_o - u$ = ty EFF -12 M

$\sigma_o = H_1 \cdot \gamma_{sat} + (H_1 - 3) \cdot \gamma_{sat} + (12 - 9) \cdot \gamma_{sat}$

$= 3 \cdot 19 + (9 \cdot 3) \cdot 19 + (3 \cdot 19) = 228$ kN/m3

$u = (12-1)\ \gamma_{set} \cdot 20 = 9 \cdot 20 = 180\ kN/m^3$

$\sigma_o' = 228 - 180 = 48\ kN/m^3$

b./ Berapa tahun peristiwa koraiLin M.a.t

Soal 7

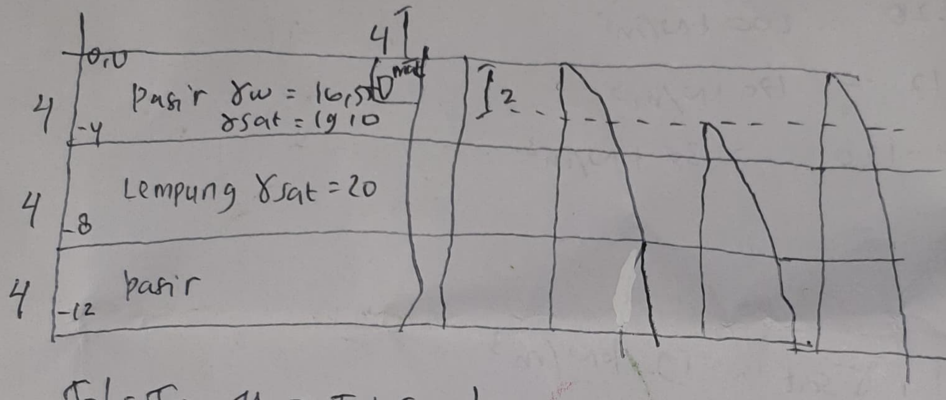
Lempung $t = 4m \cdot \gamma_{sat} = 20\ kN/m^3$

Pasir $t = 4m\ \ \gamma_w = 16{,}5\ \ \gamma_{sat}\ 19.\ kN/m^3$

M.A.t = 2m dibawah permukaan tanah

M.A.t Pizo = 4m dalam permukaan tersebut

Hitunglah teki. Eff diatas dan dibawah kepada pasir ?



$\sigma_o' = \sigma_o - u$ – Tet.Ef diatas pasir

$\sigma_o = (H_1 - 2)\ \gamma_{sat} + (H_2 - 2)\ \gamma_{sat}$

$= (4-2) \cdot 19 + (4-2) \cdot 19$

$= 76\ kN/m^3$

$u = (H_1 - 2)\ \gamma_w = (4-2) \cdot 16 = 33\ kN/m^3$

$\sigma_o' = \sigma_o - u = 76 - 33$

$\sigma_o' = \sigma_o - u$, Teg eff

$\sigma_o = (H_1 - 2) \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat} + H_3 \cdot \gamma_{sat}$

$= 4 - 2 \cdot 19 + 4 \cdot 20 + 4 \cdot 19$

$= 194\ kN/m^3$

$u = (H_1 \cdot 2)\ \gamma_w + H_2 \cdot \gamma_w + H_3 \cdot \gamma_w$

$= 2 \cdot 165 + 4 \cdot 16.5 + 4 \cdot 16.5$

$= 165\ kN/m^3$

$\sigma_o = 194 - 165 = 29\ kN/m^3$

Wahid Sapta
NIM: 182710033

Mata! : Rekayasa Geotenik Lanjutan
Dosen : Ir. Nurly Gofar. MSCE. PHd

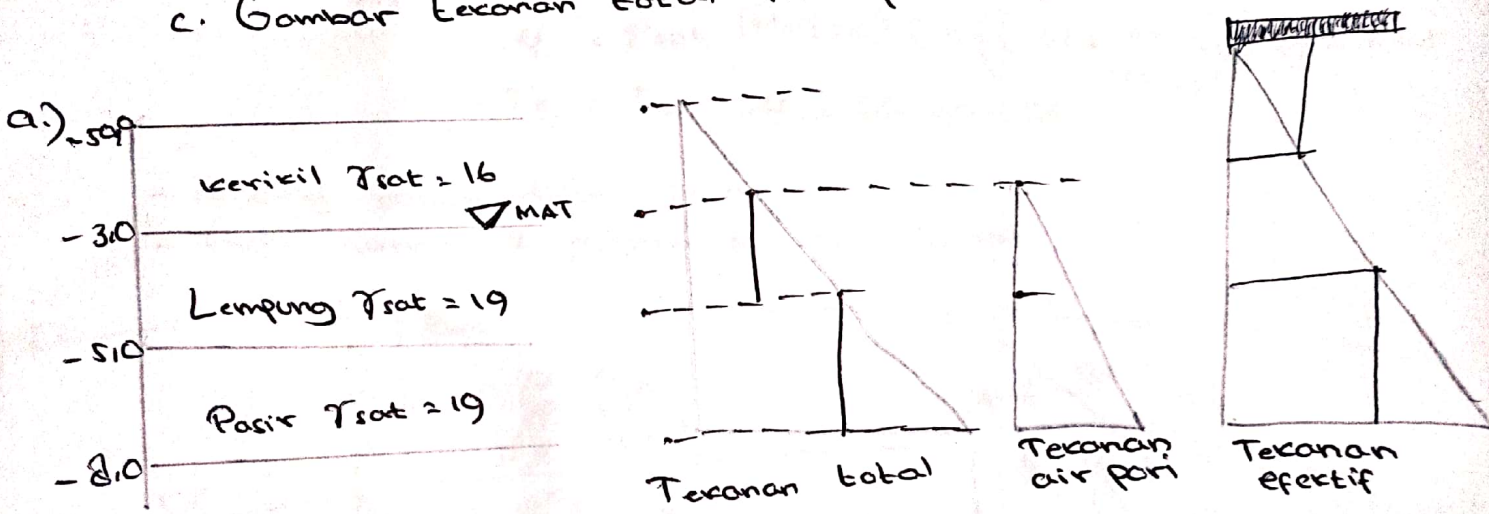
Soal = Tanah 2 lapis.

(1.)
- kerikil tebal 3m γ_{sat} = 16 kN/m³
- Lempung tebal 2m γ_{sat} = 19 kN/m³
- Pasir tebal 3m γ_{sat} = 19 kN/m³

MAT pada tanah lempung.

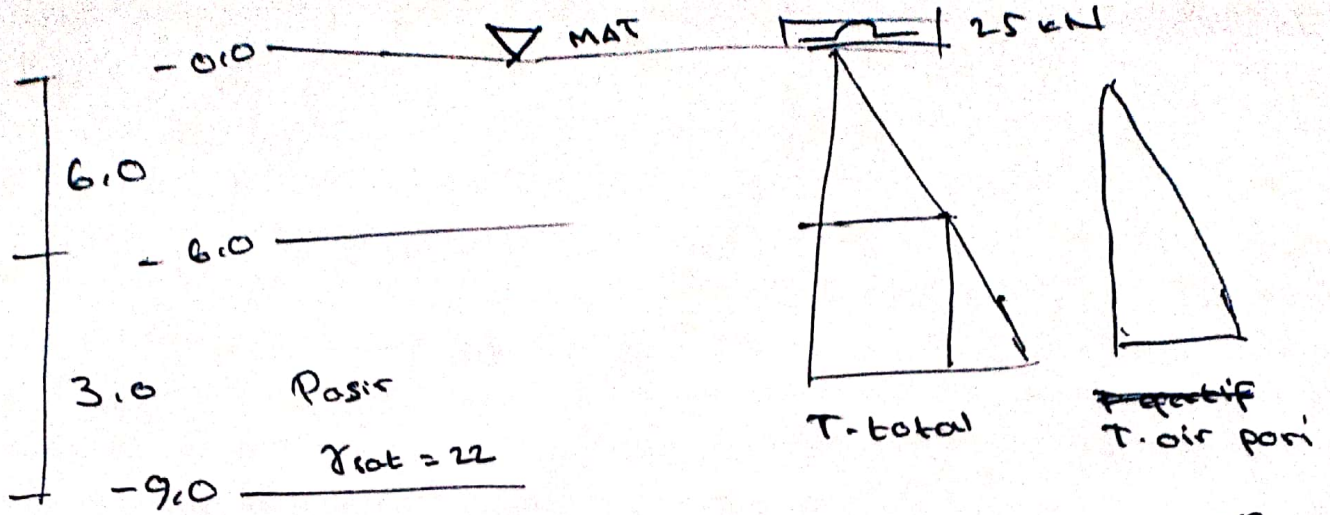
a. Gambar diagram tekanan total, tekanan efektif, tekanan air pori.
b. Gambar diagram bila beban merata 50 kN/m²
c. Gambar tekanan total MAT pd tanah lempung

a.)



(2.)
- Lapisan Lempung t=6m γ_{sat} = 21 kN/m³
- Lapisan pasir t=3m γ_{sat} = 22 kN/m³
- MAT di permukaan
- diatas lempung ada beban merata = 25 kN/m²

a. Gambar diagram t.total, t.efektif, dan t.air pori vs. kedalaman.
b. Gambar diagram yg sama bila beban merata hilang.



a.) kedalaman : −6.0

T. total : $T_o = \gamma_{sat} \cdot H_1 \times g \cdot 6 = 21 \times 6 \times 25 \times 6 = 150$

$= 126 + 150 = 276$

$u = \gamma_{sat} \cdot H_1 = 0 + 6 \cdot 25 = 150$.

$T'_o = T_o - u = 276 - 150 = 126$ kN/m3

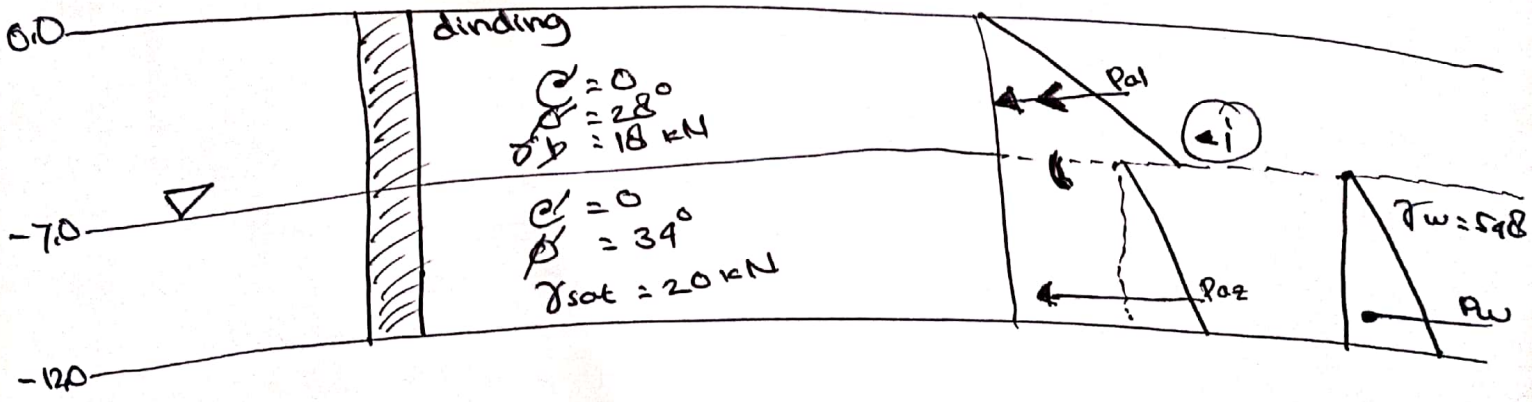
kedalaman −9 m

T. total $T_o = \gamma_{sat} \cdot H_2 \times H_2 \cdot g = 22 \times 3 = 66 + 150 = 216$

$u = \gamma_{sat} \cdot (H_1 + H_2) \times g = 0((H_1 + H_2)) \, 9 \times 25 = 225$

$T'_o = T_o - u = 66 - 0 = 66$

(3.) - dinding tanah dalam 12 m
- masa tanah 2 lapisan dg sifat tanah



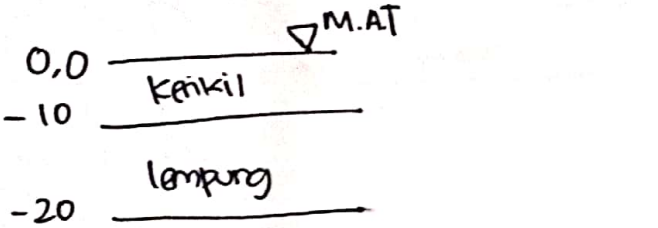
5. - Kerikil 10m γ_{sat} = 22 KN
   - Lempung 10 m γ_{sat} = 20 KN
   - MAT permukaan dengan tanah
   - Berat kerikil 17 KN

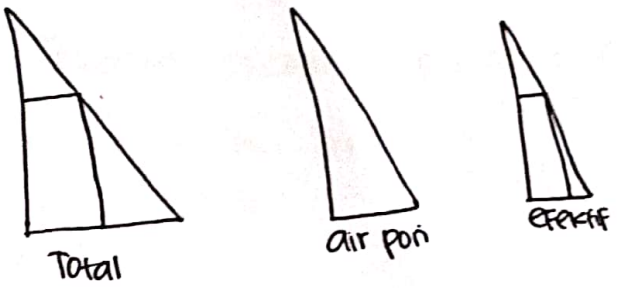
a. Gambar diagram tekanan total, tekanan efektif, & tekanan air pori Vs. kedalaman

b. Gambar diagram yang sama penambahan beban merata 30 KN

c. Gambar yang sama, bila beban merata telah menyebabkan Pengaringan tanah kerikil / M.A.T turun sampai lempung

a)





- Dalam -10

$T_O = \gamma_{sat} . H_1 = (22 \times 10) = 220$

$\mu = \gamma_w . H_1 = 17 \times 10 = 170$

$T_O' = T_O - \mu = 220 - 170 = 50$

- Dalam -20

$T_O = \gamma_{sat} . H_1 + \gamma_{sat} . H_2 = (22 \times 10) + (20 * 10) = 420$ KN

$\mu = \gamma_w . (H_1 + H_2) = 17 \times 20 = 340$ KN

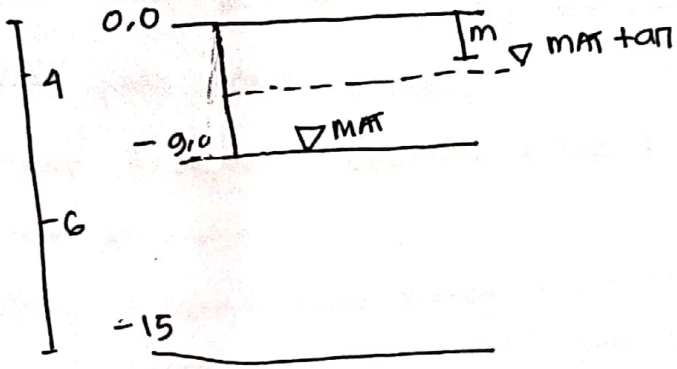
$T_O' = T_O - \mu = 420 - 340$

$= 80$ KN //

6. - Lapisan pasir 9m . $\gamma_{sat} = 19$ $\gamma_w = 16 kN$
- Lapisan Lempung 6m . $\gamma_{sat} = 20$
- MAT = -6m
- Tiba - tiba MAT naik 3m

Tentukan T. eff. pd dalam & dan 12 m dibawah Permukaan tanah
a) Segera setelah kenaikan MAT
b) Beberapa tahun setelah peristiwa kenaikan MAT

a)



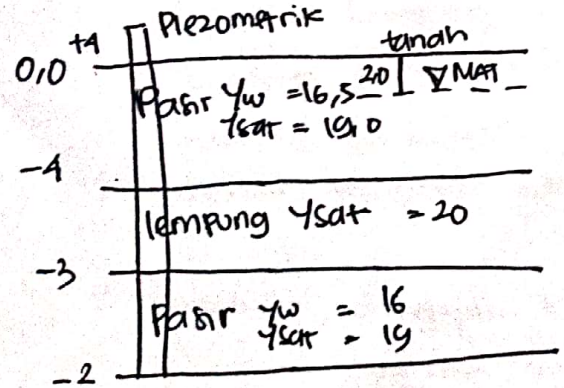
Tekanan efektif pada kedalaman & setelah naik mat. dalam tanah

$= \gamma_w . H_1 + H^{(8-3)} . \gamma_{sat} - N (\frac{H}{5} \times 10\ m)$

$= 16 + 5 . 19 - 5 \times 10$

7. -lembung tebal - 4m - γ_{sat} = 20kN
-Pasir t = 4 -> γ_w = 16,5 - γ_{sat} = 19kN
- Mat 2m bawah tanah
- Mat Piezometrik = 4m atas tanah

a. Tekanan efektif diatas & dibawah lapisan pasir



Tekanan efektif = $T_0 = H \times \gamma_w + H . \gamma_{sat} = 2 \times 16,5 + 2 \times 19 = 71$

$u = 2 \times 10 = 20$

$T_0' = T_0 - u = 71 - 20$

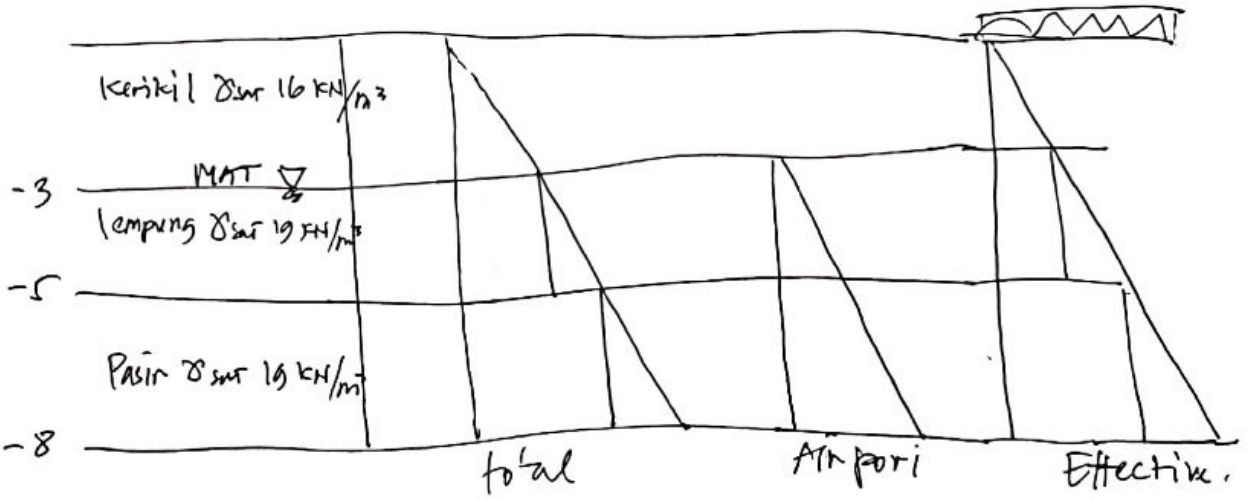
$= 51$

Nama : Zul Aslam
Nim : 182710039
Tugas III Geoteknik lanjutan.

Jawab : Dik

(I) - kerikil tebal 3m $\gamma_s = 16$ KN/m³
- lempung tebal 2m $\gamma_{sat} = 19$ KN/m³
- Pasir Tebal 3m ; $\gamma_{sat} = 19$ KN/m³
MAT = para permukaan lempung

Ditanyakan : a. Gambarkan diagram total dan Tekanan efektif dan air pori terhadap kedalaman.
b. Gambar diagram, bila suatu beban merata 50 KN/m² di letakan para permukaan Tanah.
c. Gambar diagram Tekanan total Setelah proses Konsolidasi



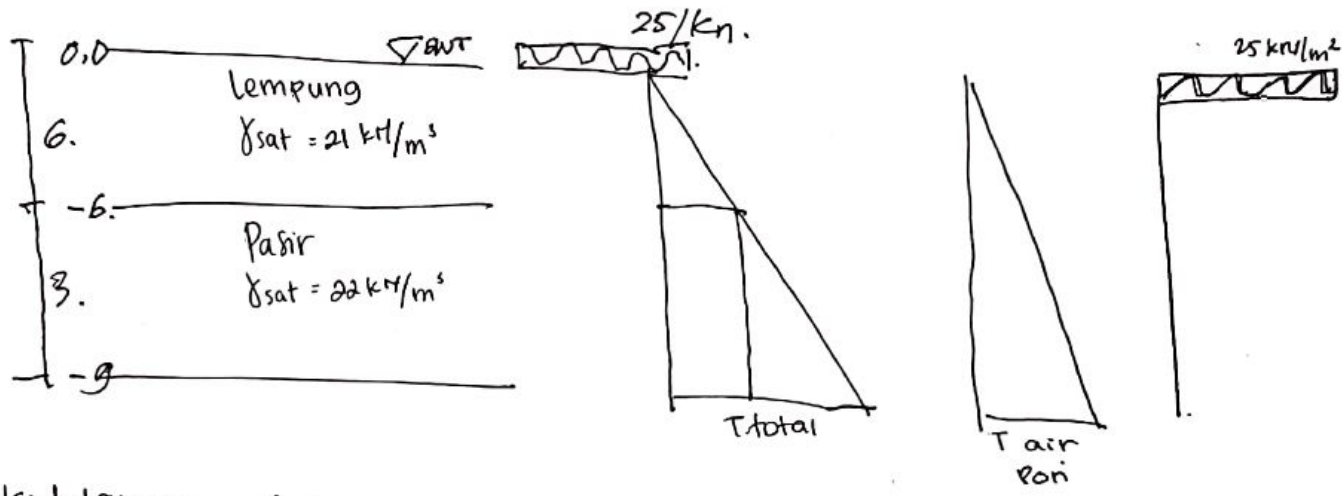
Pada kedalaman 3m, tekanan total $\sigma_0 = 16 \times 3 = 48$ KN/M³
tekanan pori $\mu = 0$
Tekanan Effektiv $\sigma_0' = 48 - 0 = 48$ KN/M³.

Pada kedalaman 5m : Tekanan total $\sigma_0 = (16 \times 3) + (19 \times 2) = 86$ KN/M³
tekanan pori $\mu = 2 \times 10 = 20$ KN/m³.
Tekanan Effektiv $\sigma_2' = 86 - 20 = 66$ KN/m³.

Pada kedalaman 8m tekanan total $\sigma_0 = (16 \times 3) + (19 \times 2) + (19 \times 3) = 143$ KN/m³
Tekana pori $\mu = (2 \times 10) + (3 \times 10) = 50$ KN/m³
$\sigma_2' = 143 - 50 = 93$ KN/m³

(2) - Lapisan lempung $t = 6m$ $\gamma_{sat} = 21\ kN/m^3$
Lapisan Pasir $t = 3m$ $\gamma_{sat} = 22\ kN/m^3$
MAT di permukaan
Atas lempung ada beban merata $= 25\ kN/m^2$

a). Gambar diagram tekanan total, t eff, tekanan air pori vs kedalaman
b). Gambar diagram yang sama bila beban merata tersebut dihilangkan.



a). Kedalaman : -6,0 m

T. total $= \sigma_0 = \gamma_{sat} \cdot H_1 + g \cdot 6 = 21 \times 6 + (25 \times 6) = 126 + 150 = 276$

$u = \gamma_w \cdot H_1 = 0 + 6 \cdot 25 = 150$

$\sigma_0' = \sigma_0 - u = 276 - 150 = 126\ kN/m^3$

Kedalaman = -9 m

T. total $\sigma_0 = \gamma_{sat} \cdot H_2 + H_2 \cdot g = 22 \times 3 + 6 \cdot 25 = 66 + 150 = 216$

$u = \gamma_w \cdot (H_1 + H_2) = 0 + (H_1 + H_2) \cdot g = 9 \times 25 = 225$

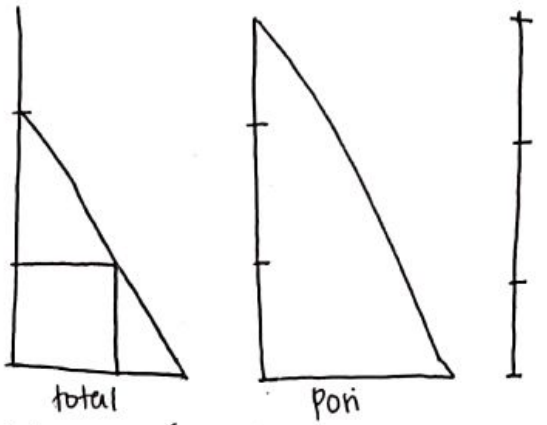
$\sigma_0' = \sigma_0 - u = 66 - 0 = 66$

Nama : Zul Aslam.
Nim : 18271003g
Tugas IV

(3). ÷ Kolam dalam 5m
tanah lempung 5m, γ_{sat}: 19 kN/m³
Pasir tebal 5m, γ_{sat} = 18kN/m³

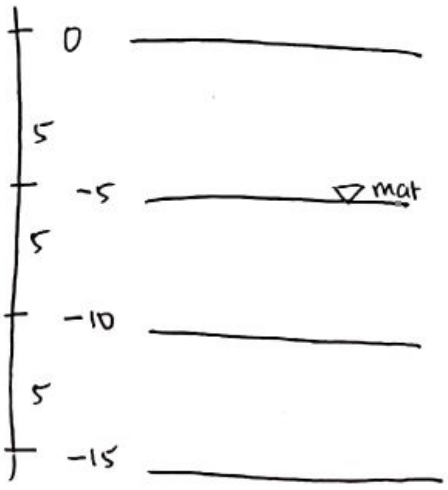
a. Gambar diagram tekan total, tekanan efektif, dan tekanan air pori vs. kedalaman
b. Gambar diagram yang sama bila tebal kolam di keringkan airnya.

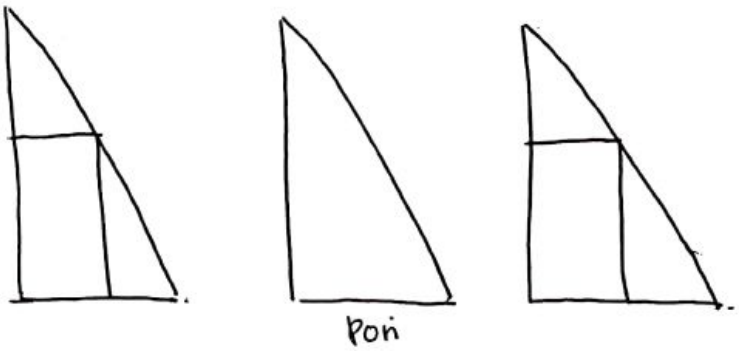
a.



Tek total. $\sigma = (5 \times 10) + (5 \times 19) + (5 \times 18) = 235$ KN/m²
Air pori $\mu = 10(5+5+5) = 150$ KN/m³
Tek Effec. $\sigma_o' = 235 - 150 = 85$ KN/m³

b.

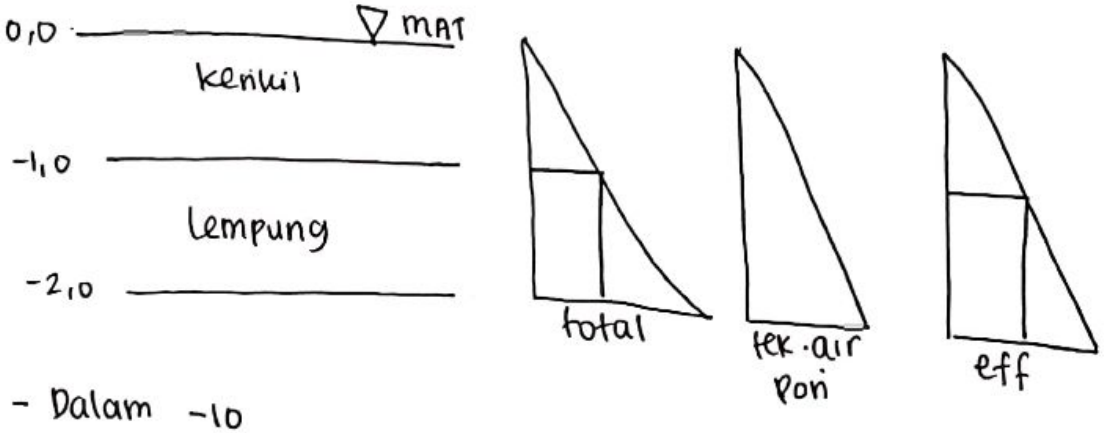




No ⑤ . Dik : Kerikil 10 m . γ_{sat} : 22 kN/m³
lempung 10 m γ_{sat} = 20 kN/m³
MAT sama dengan permukaan tanah
Berat jenis kering kerikil = 17 kN/m³

a. Gambar tekanan total, tekanan efektif, dan tekanan air pori Vs kedalaman
b. Gambar yang sama setelah penambahan beban merata = 30 kN/m²
c. Gambar diagram yang sama apabila beban merata telah menyebabkan pengeringan tanah kerikil (MAT ~~sa~~ turun sampai lempung).

ⓐ



- Dalam -10

σ_0 : $\gamma_{sat} . H_1$: (22 × 10) = 220
u : $\gamma_w . H_1$ = 17 × 10 = 170
σ_0' : $\sigma_0 - u$ = 220 - 170 = 50

- Dalam -20

σ_0 : $\gamma_{sat} . H_1 + \gamma_{sat} . H_2$: (22×10) + (20×10) = 420 kN
u : $\gamma_w . (H_1 + H_2)$ = 17 × 20 = 340 kN
σ_0' : $(\sigma_0 - u)$ = 420 - 340 = 80 kN

soal ⑥ Diketahui : Lapisan pasir 9m . $\gamma_{sat} = 19$ $\gamma_w = 16 kN$

Lapisan lempung 6m . $\gamma_{sat} = 20$

MAT = -6m

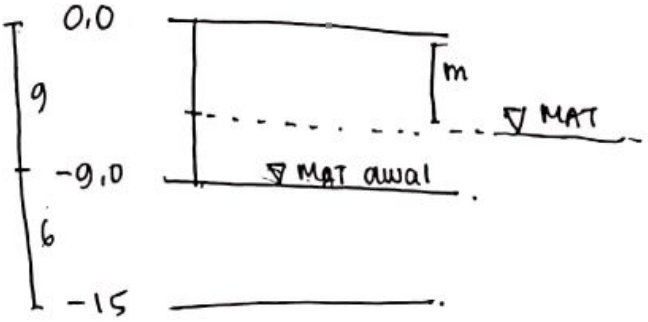
tiba-tiba MAT naik 3m

Ditanya : ~~a~~. Tent. tekanan eff pada kedalaman 8m dan 12 m dibawah tanah

a. segerah setelah kenaikan MAT

b. berapa tahun peristiwa kenaikan MAT

ⓐ.



Tekanan eff pada 8m setelah naik MAT

$= \gamma_w . H_1 + (8-3)\gamma_{sat} - \mu(5 \times 10\ m)$

$= 16 . 6 + 5 . 19 - 5 \times 10$

jawab. tek. pada kedalaman 8 m.

$\sigma = (3 \times 19) + (19 \times 5) = 152\ KN/m^3$

$\mu = (0 \times 3) + (10 \times 5) = 50\ KN/m^3$

$\sigma' = 152 - 50 = 102\ KN/m^3$

Tekanan pada kedalaman 12 m.

$\sigma = (3 \times 19) + (19 \times 6) + (20 \times 3) = 231$

$\mu = (0 \times 3) + 10(6+3) = 90\ KN/m^3$

$\sigma' = 231 - 90 = 141\ KN/m^3$

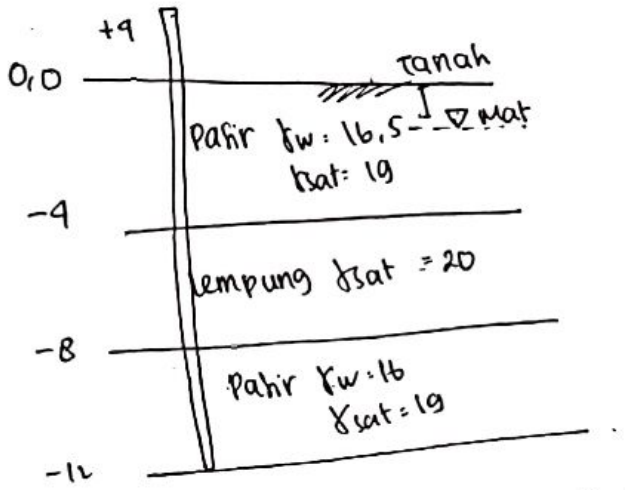
Soal ⑦ . Diketahui : lempung tebal 4m $\gamma_{sat} = 20$ kN

Pasir t=4 $\gamma_w = 16{,}5$ $\gamma_{sat} = 19$ kN/m³

MAT 2 m bawah tanah

MAT Pietometrik : 4m atas tanah

ⓐ. Hit. tekanan eff diatas dan bawah pasir



Tekanan eff: $\sigma_0 = H \times \gamma_w + H \times \gamma_{sat}$

$= (2 \times 16{,}5) + (2 \times 19) + (4 \times 20) +$

$u = 2 \times 10$

$\sigma_0' = \sigma_0 - u$

Para tekanan effective di atas pasir

Tek total $\sigma_0 = (16{,}5 \times 2) + (19 \times 2) = 71$ kN/m³

Air pori $u = (0 \times 2) + (10 \times 2) = 20$ kN/m³

Tek. Effekti $\sigma' = 71 - 20 = 49$ kN/m³

Dan dibawah lapisan pasir

tek. total $\sigma_0 = (16{,}5 \times 2) + (19 \times 2) + (20 \times 4) + (16 \times 2) + (19 \times 2) =$

$= 33 + 38 + 40 + 32 + 38 = 182$ kN/m³

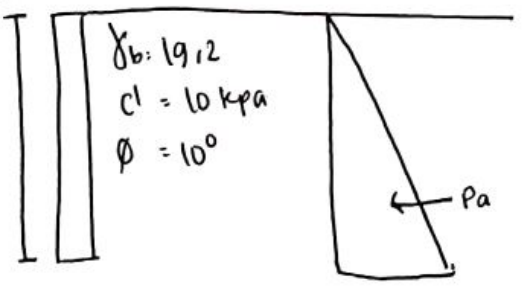
$u = (0 \times 2) + 10(2 + 4 + 2 + 2) = 100$ kN/m³

$\sigma' = 182 - 100$ kN/m³

3.2). Diketahui : γ_b : 19,2 kN/m³
c' = 10 kPa
ϕ' = 10°

Ditanya : - Hitung kedalaman penggalian yang tidak di dukung plot diagram tekanan tanah aktif jika kedalaman hingga 9 m
- Hitung gaya dan titik aplikasi yang dihasilkan

Penyelesaian :



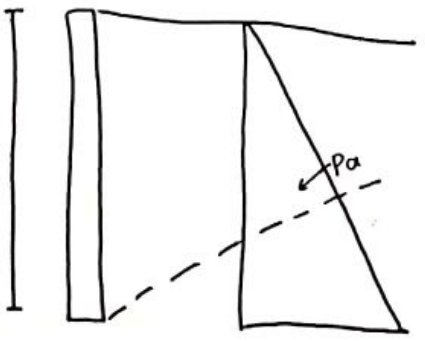
$ka = \tan^2(45 - \phi/2)$
$= \tan^2(45 - 5) = 0,709$

$\sigma a' = H.\gamma sat.ka$
$= 19,2 \cdot 0,709$
$= 13,52$

$Pa = 1/2\ \sigma a'.H$
$= 1/2 \cdot 13,52.3$
$= 20,28$ kN/m³

3.4). Dik: γ : 20,41 kN/m³
ϕ = 35°
c' : 0
δ = 20°

Dit: tentukan gaya dorong aktif. Pada dinding tinggi 9,6 Tebal timbunan bentuk sudut 10° arah horizontal



$ka = \tan^2(45 - 10/2)$
$= \tan^2(45 - 5)$
$= 0,709$

$\sigma a' = H.\gamma.ka$
$= 20,4 \cdot 0,709 = 14,36$

$Pa = 1/2\ \sigma a'.H$
$= 1/2 \cdot 14,36 \cdot 4,6 = 33,02$ kN/m³

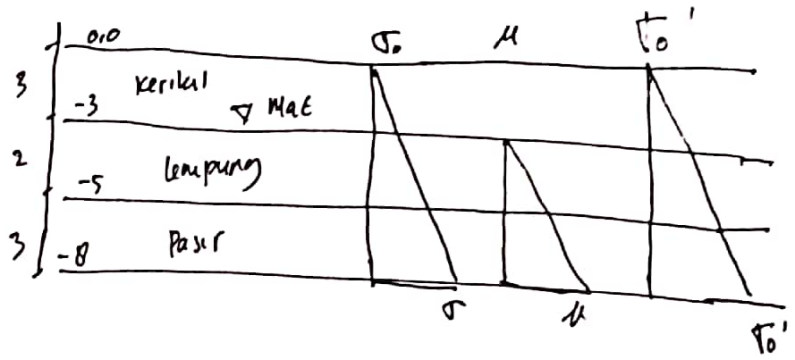
Tugas 3

Nama : Adhi Satriawon
Nim : 18271 0046

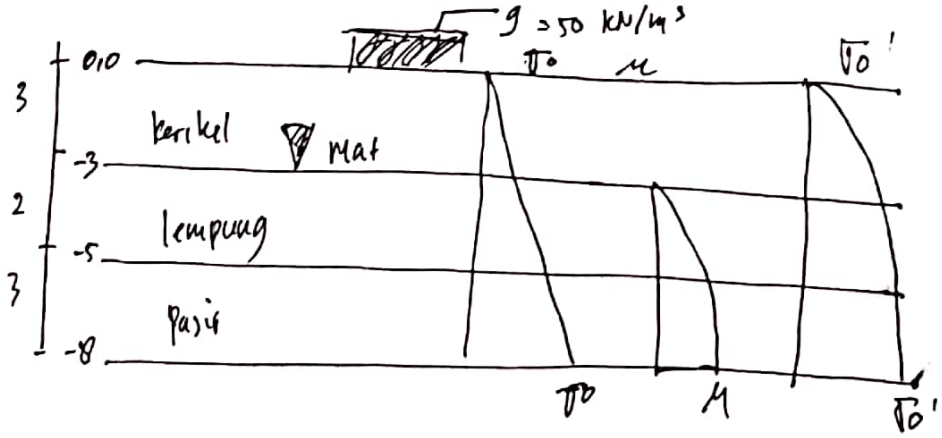
Soal I

- Lapisan 1. kerikil $t = 3$ m, $\gamma_{sat} = 16$ kN/m^3
- Lapis 2. Lempung $t = 2$ m, $\gamma_{sat} = 19$ kN/m^3
- Lapis 3. Pasir $t = 3$ m, $\gamma_{sat} = 19$ kN/m^3
- Muka pada tanah lempung

a) Gambar diagram tek. total eff. air pori

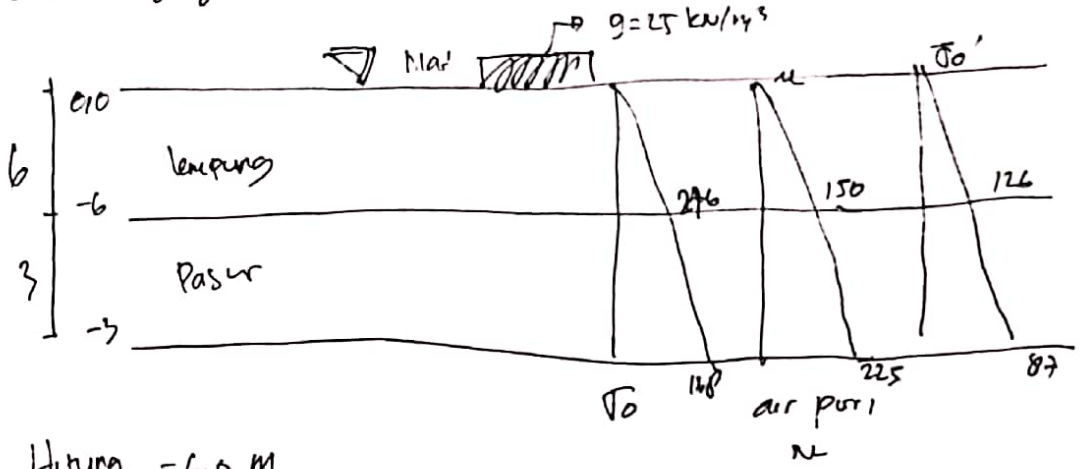


b) Gambar diagram yang sama + beban merata 50 kN/m^3



Soal 2 - Lapisan lempung t = 6m , γ_{sat} = 21 kN/m³
- Lapisan Pasir t = 3 m , γ_{sat} = 22 kN/m³
- M.AT di permukaan tanah
- diatas lempung ada beban merata 25 kN/m²
-

a) Gambar diagram tek. total, eff, air pori



Hitung -6,0 m

$\sigma_o = (H_1 . \gamma_{sat}) + (q . H_1) = (6 . 21) + (6 . 25) = 276$ kN/m²

$u = (H_1 . g) = 6 . 25 = 150$ kN/m²

$\sigma_o' = 276 - 150 = 126$ kN/m²

Hitung

$\sigma_o = H_2 . \gamma_{sat} + H_2 . g = (3 . 2) + (3 . 25) = 138$ kN/m²

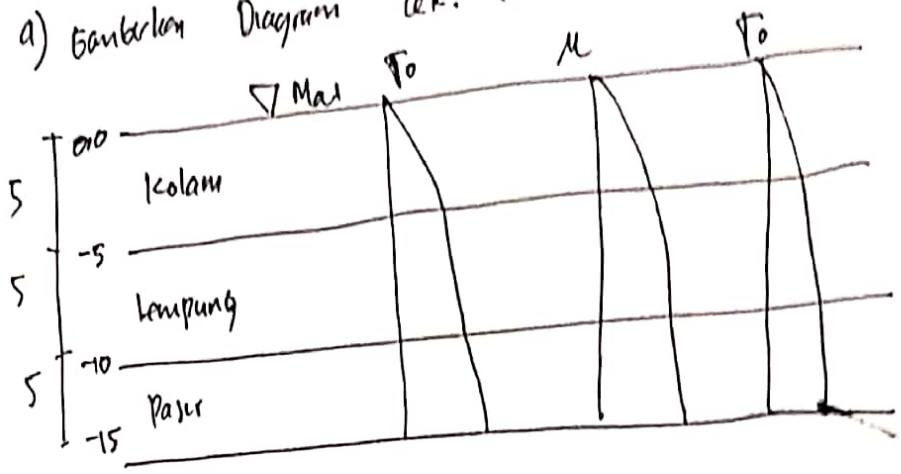
$u = (H_2 + H_1') . g = (6+3) . 25 = 225$ kN/m²

$\sigma_o' = 138 - 225 = 87$ kN/m²

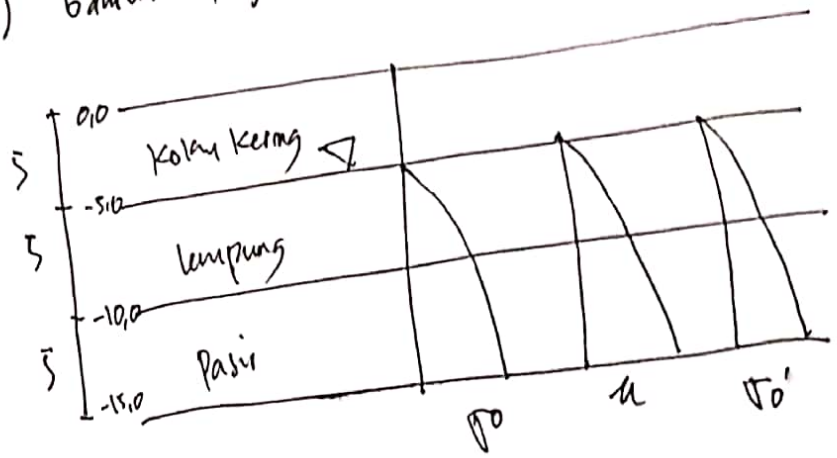
Soal 3

- kolam dalam 5m
- lapisan lempung t = 5m, γ_{sat} = 19 kn/m³
- lapisan pasir t = 5m γ_{sat} = 18 kn/m³

a) Gambarkan Diagram Tek. total, eff. dan pori



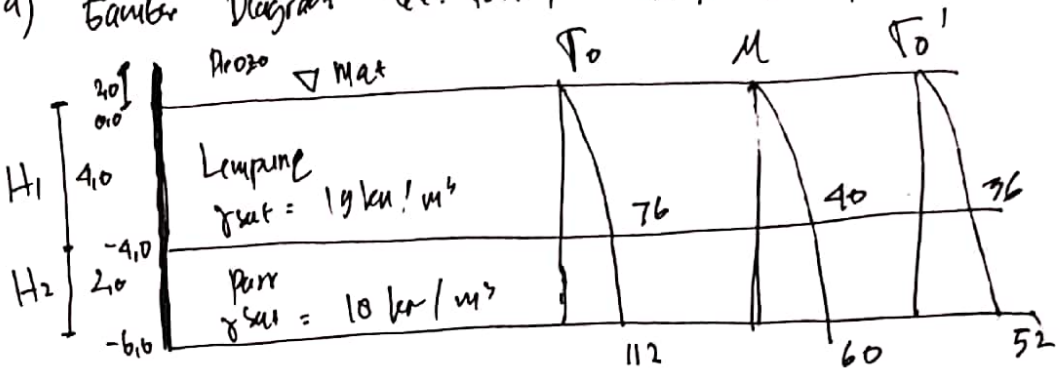
b) Gambar Diagram, kolam dikeringkan



Soal 4

- Lapisan lempung $t = 4m$ $\gamma_{sat} = 19$ kn/m³
- Lapisan Pasir $t = 2m$ $\gamma_{sat} = 18$ kn/m³
- Muka air 2m di atas tanah
- $\gamma_w = 10$ kn/m³ (asumsi)
- Muka air sama dengan muka tanah

a) Gambar Diagram tek. total, T. eff, air pori



Hitung pada kedalaman -4m

$\sigma_0 = H_1 \cdot \gamma_{sat} = 4 \cdot 19 = 76$ kn/m²

$u = H_1 \cdot \gamma_w = 4 \cdot 10 = 40$

$\sigma_0' = \sigma_0 - u = 76 - 40 = 36$ kn/m²

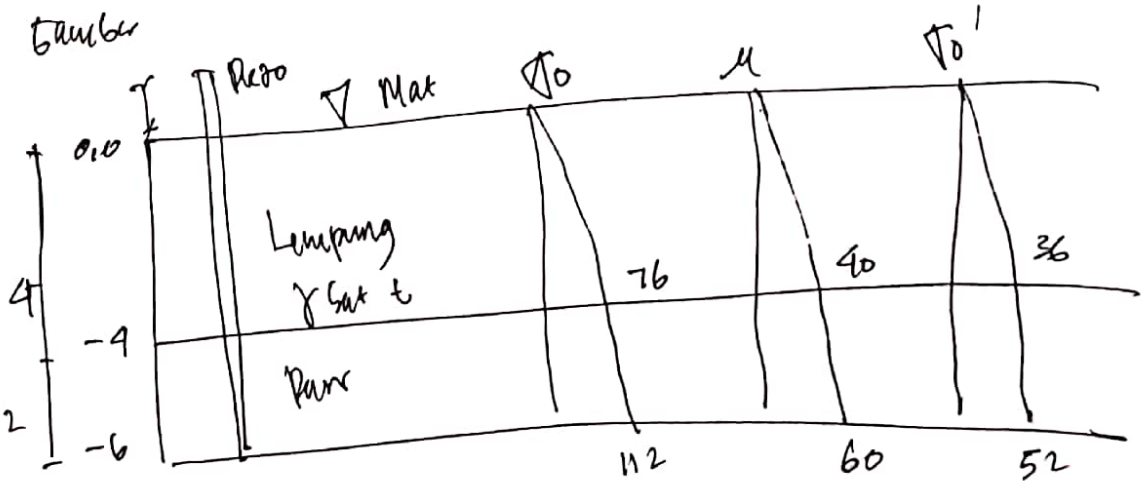
Hitung pada kedalaman -6m

$\sigma_0 = H_1 \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat} = (4 \cdot 19) + (2 \times 18) = 112$ kn/m³

$u = (H_1 + H_2) \cdot \gamma_w = 6 \cdot 10 = 60$ kn/m³

$\sigma_0' = \sigma_0 - w = 112 - 60 = 52$ kn/m³

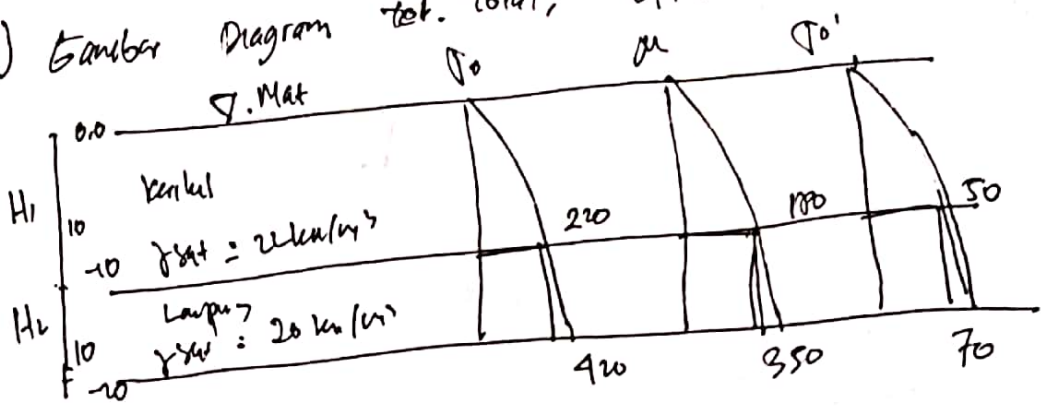
b) Gambar



Ket : Hitungannya sama.

Soal 5 - Lapisan kerikil t = 10 m, γ_{sat} = 22 kN/m³
- lapisan Lempung t = 10 m γ_{sat} = 20 kN/m³
- M.AT sama dengan muka tanah
- BJ kerikil = 17 kN/m³

a) Gambar Diagram tek. total, Eff, air pori



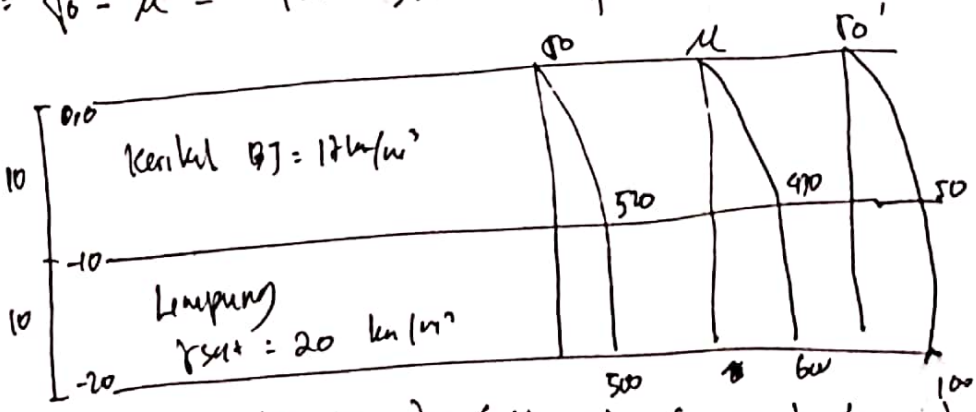
Hitung -10 m

$\sigma_o = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220$ kN/m²
$u = H_1 \cdot BJ = 10 \cdot 17 = 170$ kN/m²
$\sigma_o' = \sigma_o - u = 220 - 170 = 50$ kN/m²

Hitung -20 m

$\sigma_o = (H_2 \cdot \gamma_{sat}) + (H_2 \cdot \gamma_{sat}) = (10 \cdot 22) + (10 \cdot 20) = 420$ kN/m²
$u = (H_1 + H_2)\gamma_w = 20 \times 17 = 350$ kN/m²
$\sigma_o' = \sigma_o - u = 420 - 350 = 70$ kN/m²

b) Gambar



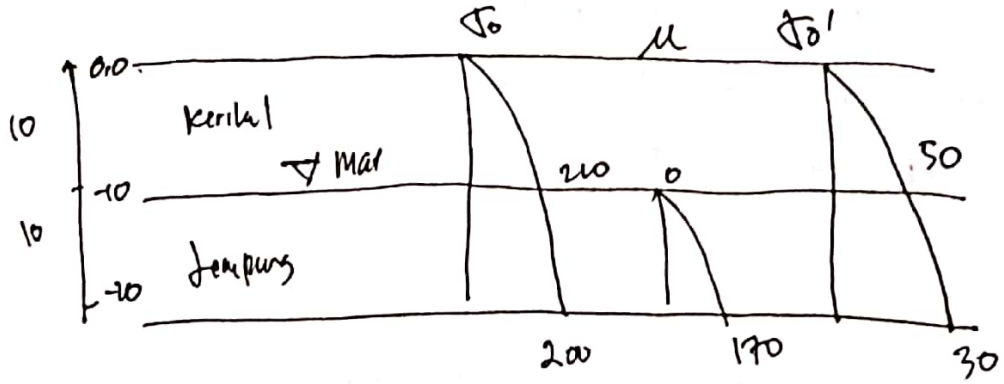
Hitung -10 m

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (H_1 \cdot g) = (10 \cdot 22) + (10 \cdot 30) = 520$ kN/m²
$u = (H_1 \cdot BJ) + (g \cdot H_1) = (10 \cdot 17) + (30 \cdot 10) = 470$ kN/m²
$\sigma_o' = \sigma_o - u = 520 - 470 = 50$ kN/m²

Hitung -20 m

$\sigma_o = (H_2 \cdot \gamma_{sat}) + (H_2 \cdot g) = (10 \cdot 20) + (10 \cdot 30) = 500$ kN/m²
$u = (H_1 + H_2) \cdot g = 20 \cdot 30 = 600$ kN/m²
$\sigma_o' = \sigma_o - u = 500 - 600 = 100$ kN/m²

c) Gambar diagram



Hitung -10 m

$\sigma o = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220$ kn/m³

$\mu = H_1 \cdot \gamma_j = 0$ kn/m³

$\sigma o' = \sigma_o - \mu = 220 - 170 = 50$ kn/m³

Hitung -20 m

$\sigma o = H_2 \cdot \gamma_{sat} = 10 \cdot 20 = 200$ kn/m²

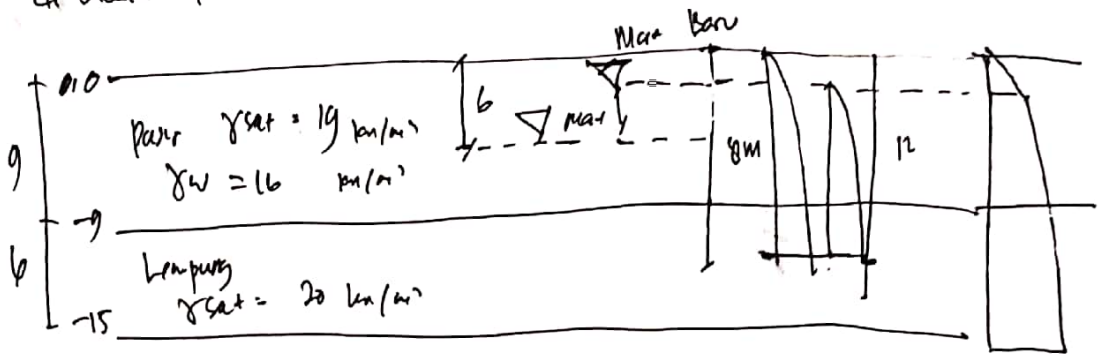
$\mu = H_2 \cdot \gamma_j = 10 \cdot 17 = 170$ kn/m²

$\sigma o' = \sigma o - \mu = 220 - 170 = 30$ kn/m²

Soal 6

- Lapis pasir $t = 9m$, $\gamma_{sat} = 19\ kn/m^3$ $\gamma_w = 16$
- Lapis lempung $t = 6m$ $\gamma_{sat} = 20\ kn/m^3$
- Muka air tanah 6m dari permukaan tanah
- Muka air baru naik 3 m

a) Tentukan tek. eff pada kedalaman 8 dan 12 m di bawah permukaan tanah



$\sigma_0' = \sigma_0 - u = \sigma_{eff} - 8m$

$\sigma_0 = (H_1 \cdot \gamma_w) + (8-3) \cdot \gamma_{sat} = (3 \cdot 19) + (5 \cdot 19) = 152\ kn/m^3$

$u = (H_1 - 3) \cdot \gamma_w = (8-3) \cdot 16 = 80\ kn/m^3$

$\sigma_0' = \sigma_0 - u = \sigma_{eff} - 12m$

$\sigma_0 = H_1 \cdot \gamma_{sat} + (H_1 - 3) \cdot \gamma_{sat} + (12-9) \cdot \gamma_{sat}$

$= 3 \cdot 19 + (9-3) \cdot 19 + (3 \cdot 19) = 228\ kn/m^3$

$u = (12-3)\ \gamma_{sat} \cdot 20 = 9 \cdot 20 = 180\ kn/m^3$

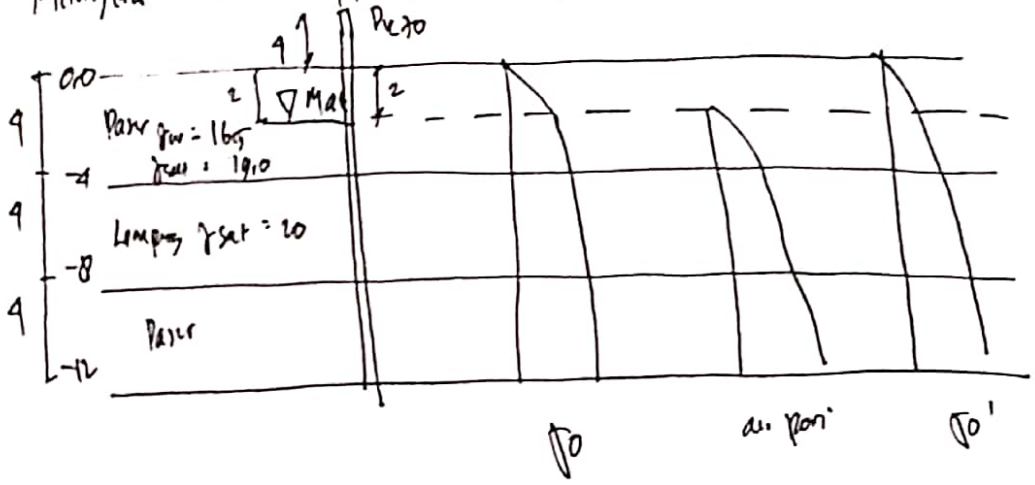
$\sigma_0' = 228 - 180 = 48\ kn/m^3$

b) Berapa tahun kenaikan M.a.t.

Soal 7

- Lempung t = 4m, γ_{sat} = 20 kn/m³
- Pasir t = 4m γ_w = 16.5 γ_{sat} = 19. kn/m³
- M.A.t = 2m dibawah permukaan tanah
- M.A.t pluto = 4m diatas permukaan tnh.

Hitunglah tek. Eff diatas dan dibawah lapisan Pasir?



σ0' = σ0 - μ - Teg. Eff diatas Pasir

$\sigma_0 = (H_1 - 2)\gamma_{sat} + (H_2 - 2)\gamma_{sat}$
$= (4-2).19 + (4-2).19$
$= 76$ kn/m²

$\mu = (H_1 - 2)\gamma_w = (4-2).16 = 33$ kn/m²

$\sigma_0' = \sigma_0 - \mu = 76 - 33 = 43$ kn/m²

σ0' = σ0 - μ. Teg Eff dibawah Pasir

$\sigma_0' = (H_1 - 2).\gamma_{sat} + H_2.\gamma_{sat} + H_3.\gamma_{sat}$
$= 4-2 .19 + 4.20 + 4.19$
$= 194$ kn/m²

$\mu = (H_1 2)\gamma_w + H_2.\gamma_w + H_3.\gamma_w$
$= 2.165 + 4.16,5 + 4.16.5$
$= 165$ kn/m²

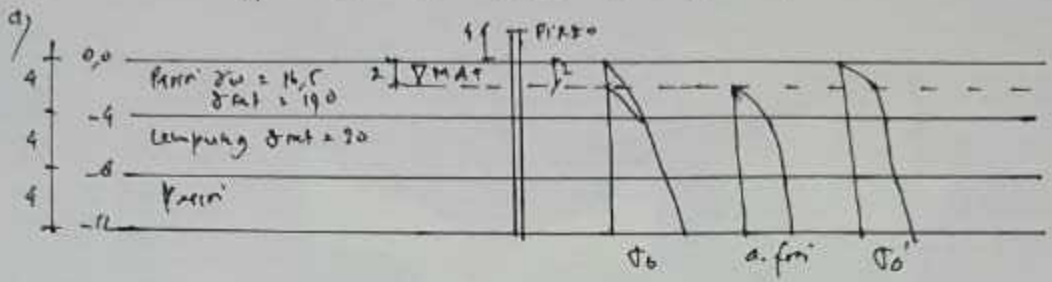
$\sigma_0' = 194 - 165 = 29$ kn/m²

Soal 7

- Lempung t = 4m . γ_{sat} = 20 kN/m³
- Pasir t = 4m . γ_w = 16,5, γ_{sat} = 19 kN/m³
- MAT = 2m dibawah permukaan tanah
- MAT - Piezo = 4m diatas permukaan tanah

Hitung tek eff diatas dan dibawah lapisan pasir

a)



⇒ σ_o' = σ_o - μ . Tag. Eff diatas pasir

$\sigma_o = (H_1 - 2) \cdot \gamma_{sat} + (H_1 - 2) \cdot \gamma_{sat}$

$= (4 \cdot 2) \cdot 19 + (4 \cdot 2) \cdot 19$

$= 76$ kN/m³

$\mu = (H_1 - 2)\, \gamma_w = (4-2) \cdot 16.5 = 33$ kN/m³

$= \sigma_o - \mu = 76 - 33 = 42$ kN/m³

⇒ σ_o' = σ - μ . Tag. Eff dibawah pasir

$\sigma_o = (H_1 - 2) \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat} + H_3 \cdot \gamma_{sat}$

$= 4 + 2 \cdot 19 + 4 \cdot 20 + 4 \cdot 19$

$= 194$ kN/m³

$\mu = (H_1 - 2)\gamma_w + H_2 \cdot \gamma_w + H_3 \cdot \gamma_w$

$= 2 \cdot 16,5 + 4 \cdot 16,5 + 4 \cdot 16,5$

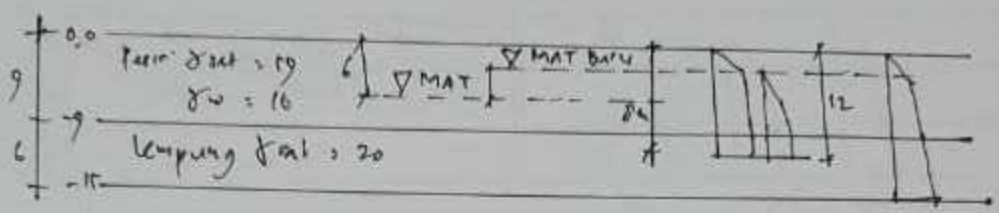
$= 165$ kN/m³

$\sigma_o' = 194 - 165 = 29$ kN/m³

Soal 6

- Lapisan pasir t = 9 m. γ_{sat} = 19 kN/m³, γ_w = 16
- Lapisan lempung t = 6 m. γ_{sat} = 20 kN/m³
- MAT letak 6 m dari permukaan tanah
- MAT berubah naik 3 m jd baru

a) Tentukan tek. eff pd kedalaman B z/a 12 m dibawah permukaan tanah



$\sigma_o' = \sigma_o - N = -8$ m

$\sigma_o = (H_1 - \gamma_w) + (8-3) \cdot \gamma_{sat} = (3 \cdot 19) + (5 \cdot 19) = 152$ kN/m²

$N = (H_1 - 3) \cdot \gamma_w = (8-3) \cdot 16 = 80$ kN/m²

$\sigma_o = 152 - 80 = 72$ kN/m²

$\sigma_o' = \sigma_o - N$ = Tegangan eff = 12 m

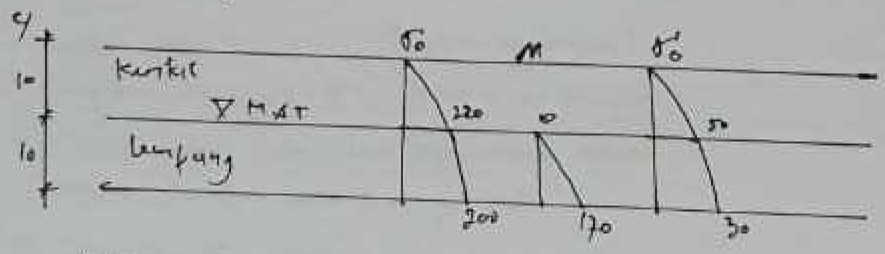
$\sigma_o = H_1 \cdot \gamma_{sat} + (H_2 - 3) \cdot \gamma_{sat} + (12 - 19) \cdot \gamma_{sat}$

$= 3 \cdot 19 + (9-3) \cdot 19 + (7 \cdot 19) = 228$ kN/m².

$N = (12 - 3) \cdot 20 = 9 \cdot 20 = 180$ kN/m²

$\sigma_o' = 228 - 180 = 48$ kN/m²

Gambar Diagram



Hitungan - 10

$\sigma_0 = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220$ kN/m²

$\mu = H_1 \cdot \gamma_1 = 0$

$\sigma_0' = \sigma_v - \mu = 220 - 170 = 50$ kN/m²

Hitungan - 20 m

$\sigma_0 = H_2 \cdot \gamma_{sat} = 10 \cdot 20 = 200$ kN/m²

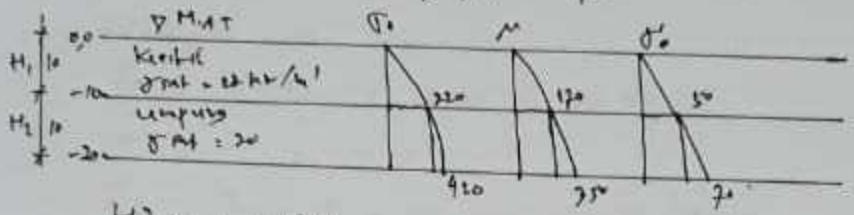
$\mu = H_2 \cdot \gamma_w = 10 \cdot 17 = 170$ kN/m²

$\sigma_0' = \sigma_0 - \mu = 200 - 170 = 70$ kN/m²

Soal 8

- Lapisan kerikil $t = 10\,m$, $\gamma_{sat} = 22\ kN/m^3$
- Lapisan lempung $t = 10\,m$ $\gamma_{sat} = 20\ kN/m^3$
- MAT dgn muka tanah
- Bj Kerikil = 17 kN/m^3

a) Gambar diagram Total, Eff, air pori



Hitungan – 10 m

$\sigma_o = H_1 \cdot \gamma_{sat} = 10 \cdot 22 = 220\ kN/m^2$

$u = H_1 \cdot \gamma_w = 10 \cdot 17 = 170\ kN/m^2$

$\sigma_o' = \sigma_o - u = 220 - 170 = 50\ kN/m^2$

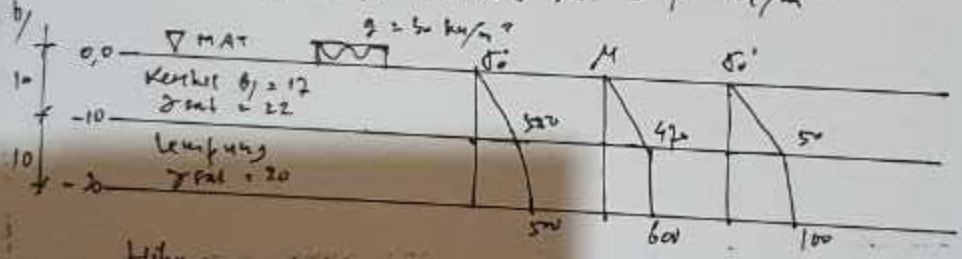
Hitungan – 20 m

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (H_2 \cdot \gamma_{sat}) = (10 \cdot 22) + (10 \cdot 20) = 420\ kN/m^2$

$u = (H_1 + H_2)\,\gamma_w = 20 \times 17 = 350\ kN/m^2$

$\sigma_o' = \sigma_o - u = 420 - 350 = 70\ kN/m^2$

b)



Hitungan – 10

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (H_1 \cdot q) = (10 \cdot 22) + (10 \cdot 30) = 520\ kN/m^2$

$u = (H_1 \cdot \gamma_j) + (q \cdot H_1) = (10 \cdot 17) + (30 \cdot 10) = 470\ kN/m^2$

$\sigma_o' = \sigma_o - u = 520 - 470 = 50\ kN/m^2$

Hitungan – 20

$\sigma_o = (H_2 \cdot \gamma_{sat}) + (H_2 \cdot q) = (10 \cdot 20) + (10 \cdot 30) = 500\ kN/m^2$

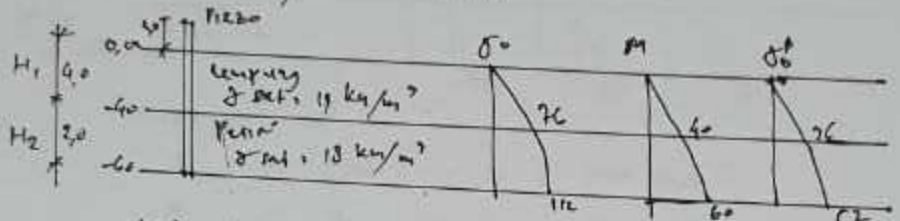
$u = (H_1 + H_2) \cdot q = 20 \cdot 30 = 600\ kN/m^2$

$\sigma_o' = \sigma_o - u = 500 - 600 = -100$

Soal 4

- lempung t : 4m . γ_{sat} = 19 kN/m³
- Pasir t = 2m . γ_{sat} = 18 kN/m³
- Piezometer 2m dr dasar tanah
- γ_w = 10 kN/m³ (Asumsi)
- MAT sama dengan muka tanah

a) Gbr diagram dg muka tanah



- Hitung pd kedalaman -4m

$\sigma_o = H_1 \cdot \gamma_{sat} = 4 \cdot 19 = 76$ kN/m²

$M = H_1 \cdot \gamma_w = 4 \cdot 10 = 40$

$\sigma'_o = \sigma_o - M = 76 - 40 = 36$ kN/m²

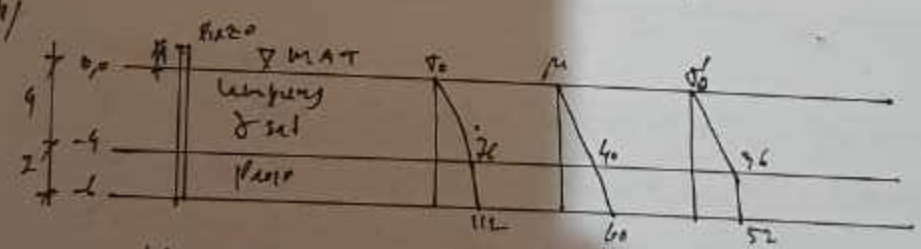
- Hitung pd kedalaman -6m

$\sigma_o = H_1 \cdot \gamma_{sat} + H_2 \cdot \gamma_{sat} = (4 \cdot 19) + (2 \cdot 18) = 112$ kN/m²

$M = (H_1 + H_2) \cdot \gamma_w = 6 \cdot 10 = 60$ kN/m²

$\sigma'_o = \sigma_o - M = 112 - 60 = 52$ kN/m²

b)

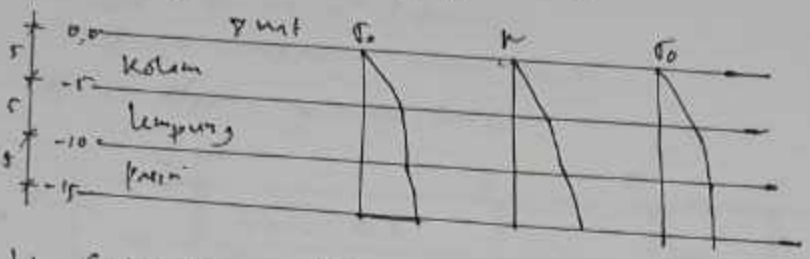


Hasil Hitungan Sama

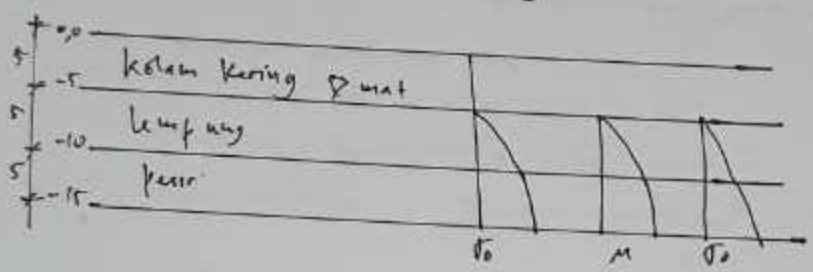
Soal 3

- Kolam dalam 5 m
- Lapisan lempung t = 5 m . γ_{sat} = 19 kN/m³
- " pasir t = 5 m . γ_{sat} = 18 kN/m³

a) Gbr diagram tek. total, eff. air pori



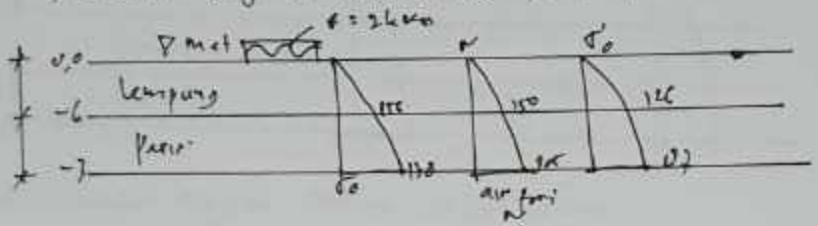
b). Gambar diagram, kolam dr kering kan



Soal 2

- Lapisan lempung t : 6m . γ_{sat} : 21 kN/m³
- Lapisan pasir t : 3m . γ_{sat} : 22 kN/m³
- muka air di permukaan tanah
- di atas lempung ada beban merata 25 kN/m²
- Anggap γ_w = 10 kN/m³

a) Gambar diagram Tek. total, Eff. air pori



Hitungan - 60 m

$\sigma_o = (H_1 \cdot \gamma_{sat}) + (q + H_1) = (6 \cdot 21) + (6 \cdot 25)$

$u = (H_1 \cdot g) = 6 \cdot 25 = 150$ kN/m²

$\sigma'_o = 276 - 150 = 126$ kN/m²

Hitungan

$\sigma_o = H_2 \cdot \gamma_{sat} + H_2 \cdot g = (3 \cdot 21) + (3 \cdot 25) = 138$ kN/m²

$u = (H_2 + H_2) \cdot g = (6+7) \cdot 25 = 225$ kN/m²

$\sigma'_o = 138 - 225 = 84$ kN/m²

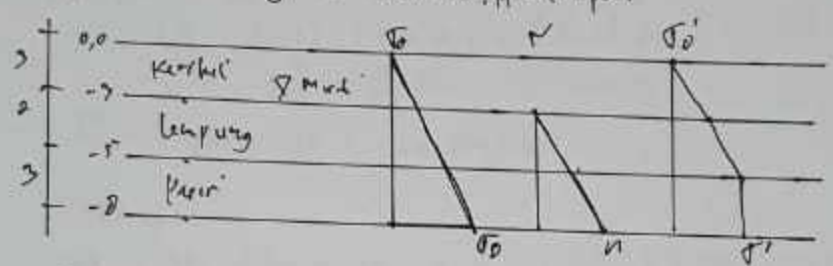
Nama : Akhiruddin
NIM : 1827 10045

Tugas - 3

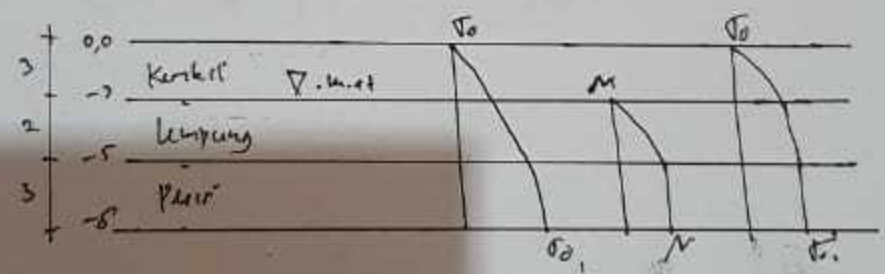
⇒ Soal :

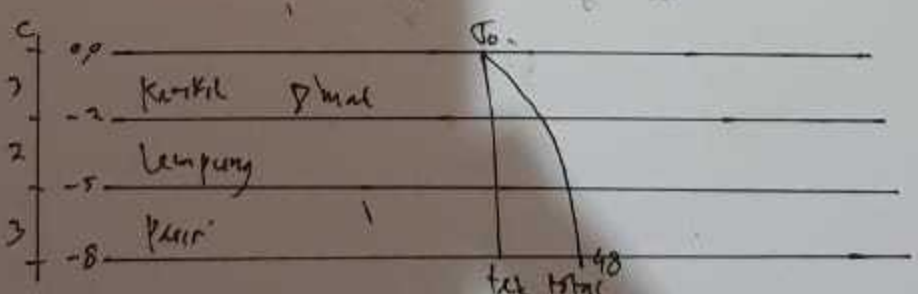
- Lapis 1 Kerikil t : 3m . γ_{sat} : 16 kN/m³
- " 2 Lempung t : 2 m γ_{sat} : 17 kN/m³
- " 3 Pasir t : 3 m γ_{sat} : 19
- Muka pada tanah lempung

a) Gambar diagram tek total, tf. air pori



b. Gambar diagram yg sama + beban merata 50 kN/m²

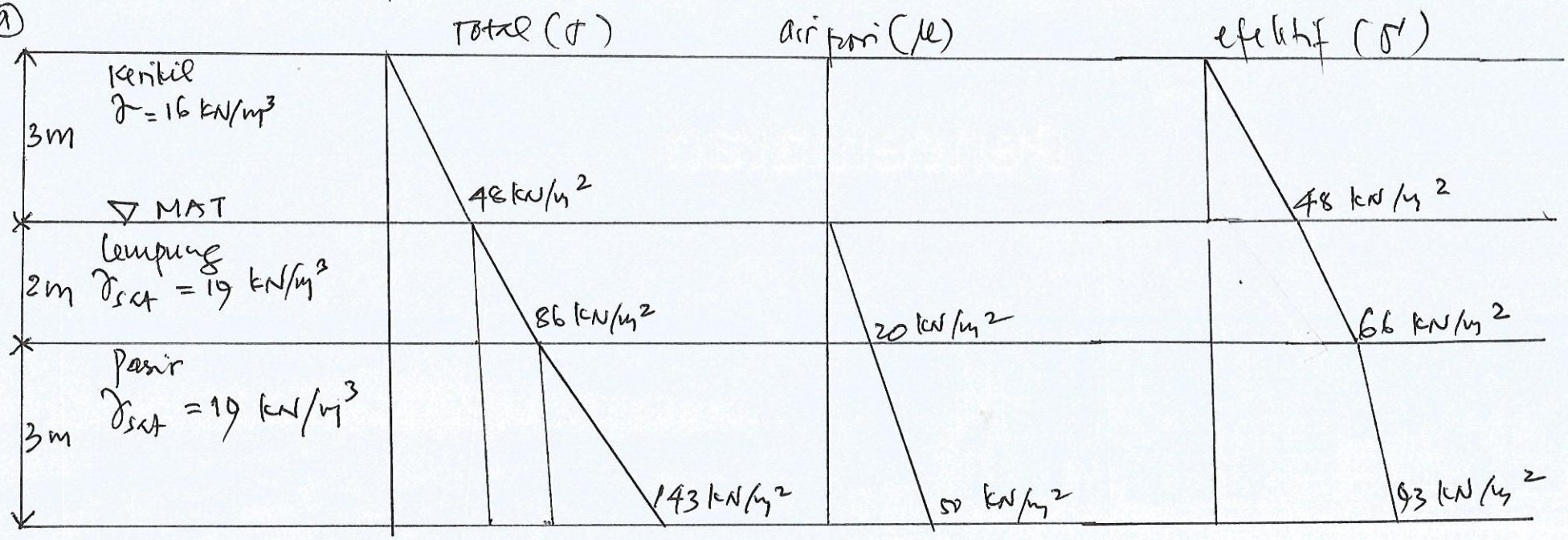




$\sigma_0 = H_1 \cdot \gamma_{sat} = 3 \cdot 16 = 48$ kN/m²

Soal 1 ARHAB/182710032

(a)



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

Tekanan air pori (μ):

kedalaman 3 m, $\mu = 0$

kedalaman 5 m, $\mu = 2m \cdot \gamma_w = 20\ kN/m^2$

kedalaman 8 m, $\mu = 5m \cdot \gamma_w = 50\ kN/m^2$

Tekanan total (σ):

kedalaman 3 m, $\sigma = 3m \cdot \gamma = 48\ kN/m^2$

kedalaman 5 m, $\sigma = 3 \cdot 16 + 2 \cdot 19 = 86\ kN/m^2$

kedalaman 8 m, $\sigma = 86 + 3 \cdot 19 = 143\ kN/m^2$

Tekanan efektif (σ') $= \sigma - \mu$

kedalaman 3 m, $\sigma' = 48\ kN$

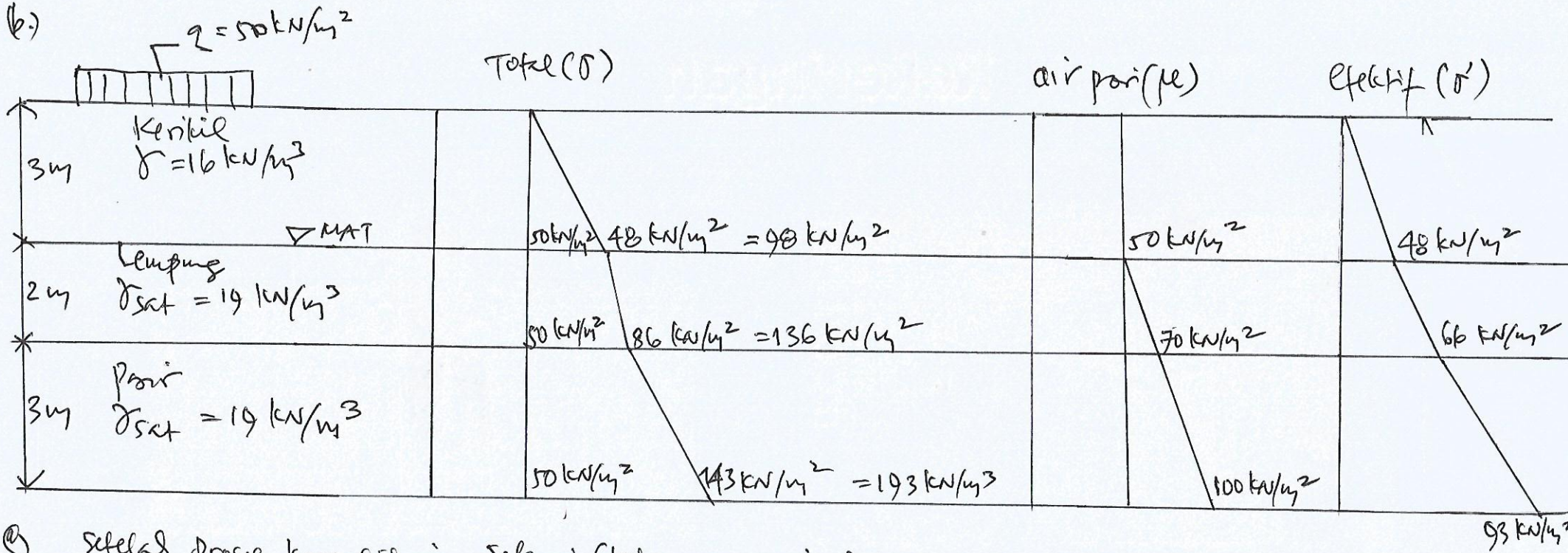
kedalaman 5 m, $\sigma' = 86 - 20 = 66\ kN/m^2$

kedalaman 8 m, $\sigma' = 143 - 50 = 93\ kN/m^2$

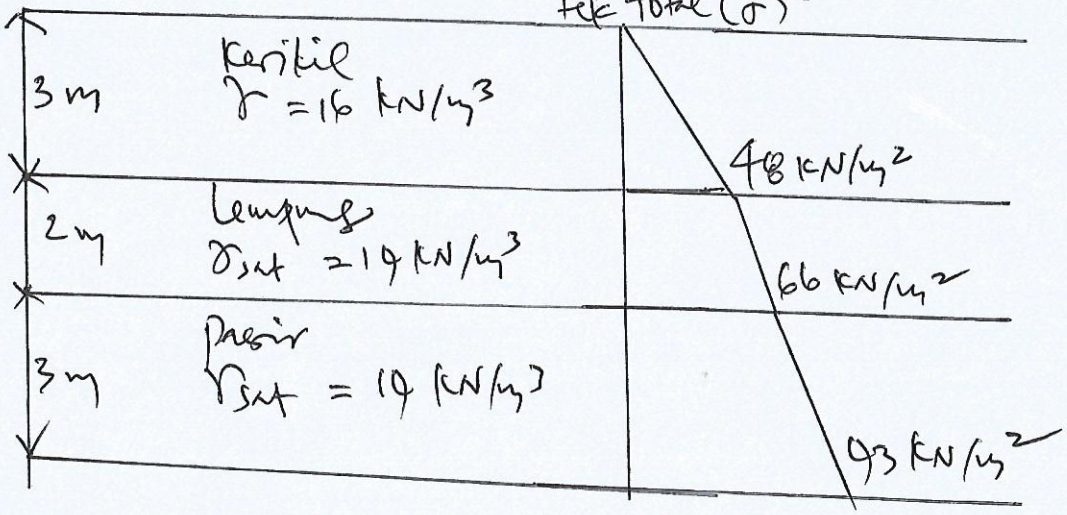
kedalaman (m)	σ (kN/m^2)	μ (kN/m^2)	$\sigma' = \sigma - \mu$ (kN/m^2)
3	48	0	48
5	86	20	66
8	143	50	93

Soal 1 ARHAB / 182710032

b.)



(c) Setelah proses konsolidasi selesai (keluarnya air dri pori-pori tnah).



Berat masa lempung = 19 − 10 = 9 kN/m³

Berat masa kerikil = 19 − 10 = 9 kN/m³

Tegangan total (σ):

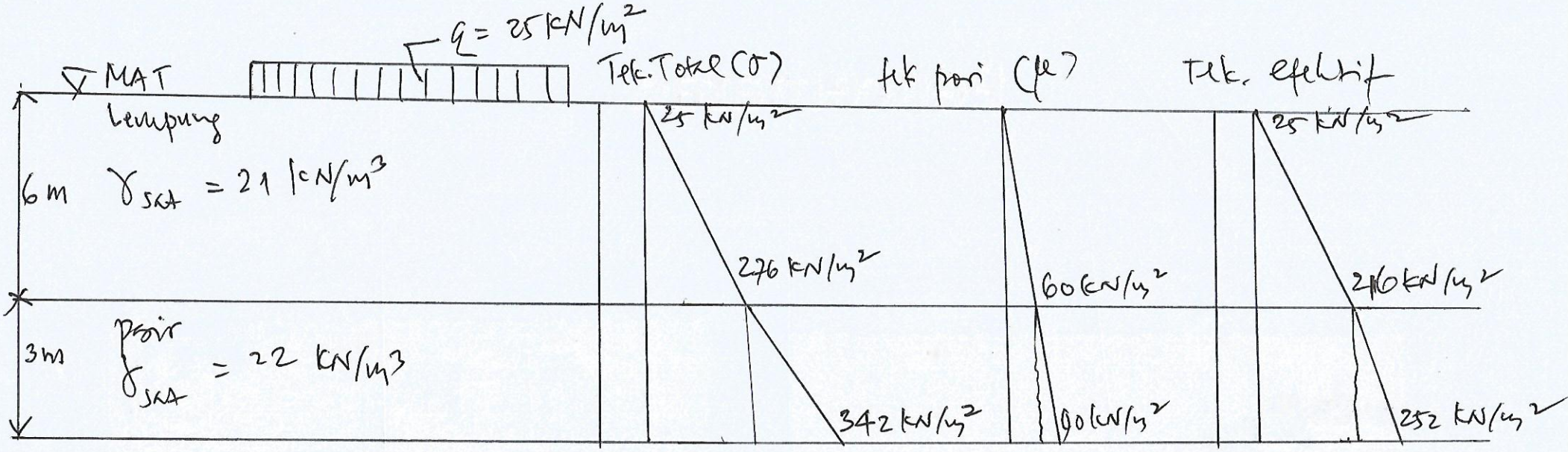
kedalaman 3m, σ = 3 × 16 = 48 kN/m²

kedalaman 5m, σ = 48 + 2 × 9 = 66 kN/m²

kedalaman 8m, σ = 66 + 3 × 9 = 93 kN/m²

Soal 2 ARHAB/1827/10032

(a)



(a)

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

Tekanan air pori (μ):

kedalaman 6 m, $\mu = \gamma_w \cdot 6 = 60\ kN/m^2$

kedalaman 9 m, $\mu = \gamma_w \cdot 9 = 90\ kN/m^2$

Tekanan total (σ):

kedalaman 6 m, $\sigma = q \cdot 6 + 6 \cdot 21 = 276\ kN/m^2$

kedalaman 9 m, $\sigma = q \cdot 6 + 6 \cdot 21 + 3 \cdot 22 = 342\ kN/m^2$

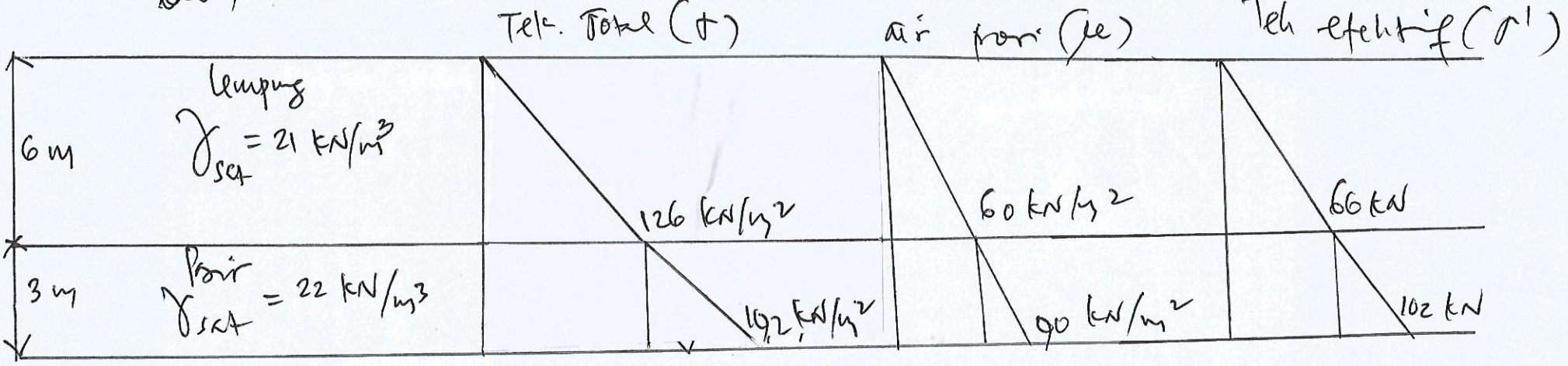
Tekanan efektif, $\sigma' = \sigma - \mu$

kedalaman 6 m, $\sigma' = 276 - 60 = 216\ kN/m^2$

kedalaman 9 m, $\sigma' = 342 - 90 = 252\ kN/m^2$

soal 2 ARHAB/1827100032

(b) Jika beban merata dihilangkan



Tekanan air pori (μe):

kedalaman 6 m, $\mu e = 6 . \gamma w = 60\ kN/m^2$

9 m, $\mu e = 9 . \gamma w = 90\ kN/m^2$

Tekanan total (σ):

kedalaman 6 m, $\mu e = 6 . 21 = 126\ kN/m^2$

kedalaman 9 m, $\mu e = 6 . 21 + 3 . 22 = 192\ kN/m^2$

$\sigma' = \sigma - \mu e$

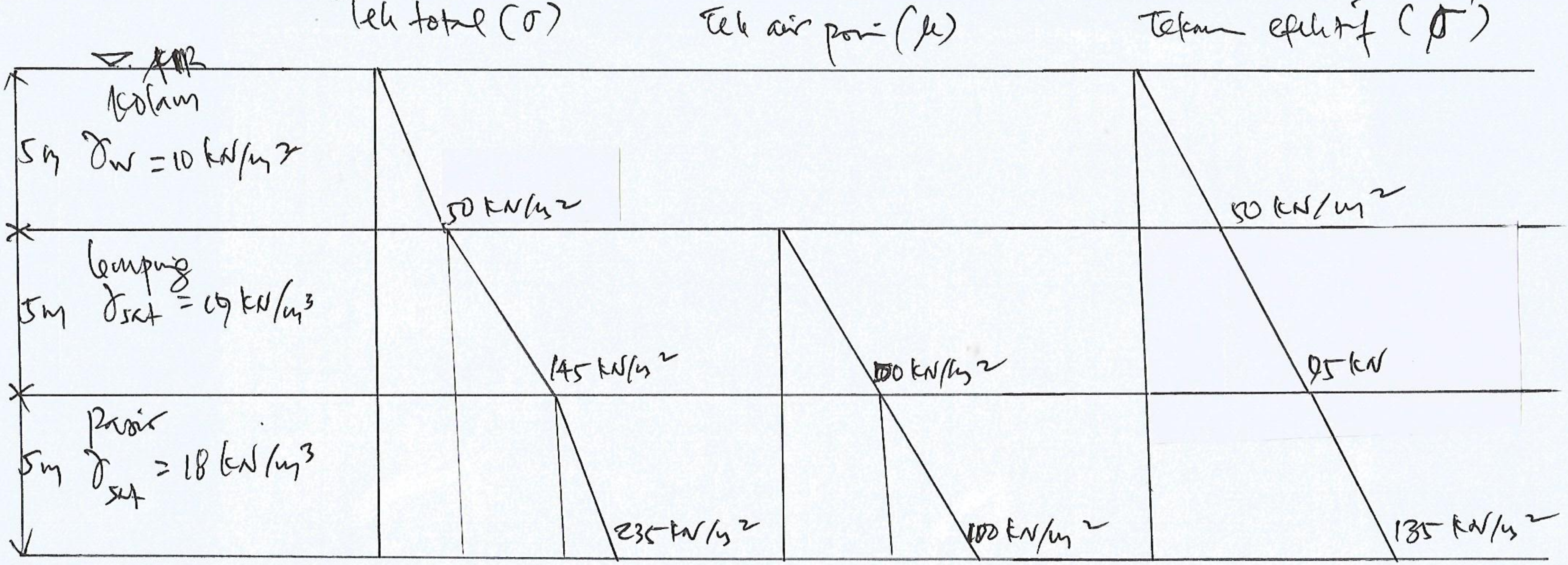
kedalaman 6 m, $\sigma' = 126 - 60 = 66\ kN/m^2$

kedalaman 9 m, $\sigma' = 192 - 90 = 102\ kN/m^2$

Soal 3

ARHAB /182710032

(a)



Tekanan air pori (μ).

kedalaman 5 m, $\mu = 0$

kedalaman 10 m, $\mu = 10 \cdot 10 = 100\ kN/m^2$

kedalaman 15 m, $\mu = 10 \cdot 10 = 100\ kN/m^2$

Tekanan total (σ):

kedalaman 5 m, $\sigma = 5 \cdot 10 = 50\ kN/m^2$

kedalaman 10 m, $\sigma = 50 + 5 \cdot 19 = 145\ kN/m^2$

kedalaman 15 m, $\sigma = 145 + 5 \cdot 18 = 235\ kN/m^2$

Tegangan efektif $\sigma' = \sigma - \mu$

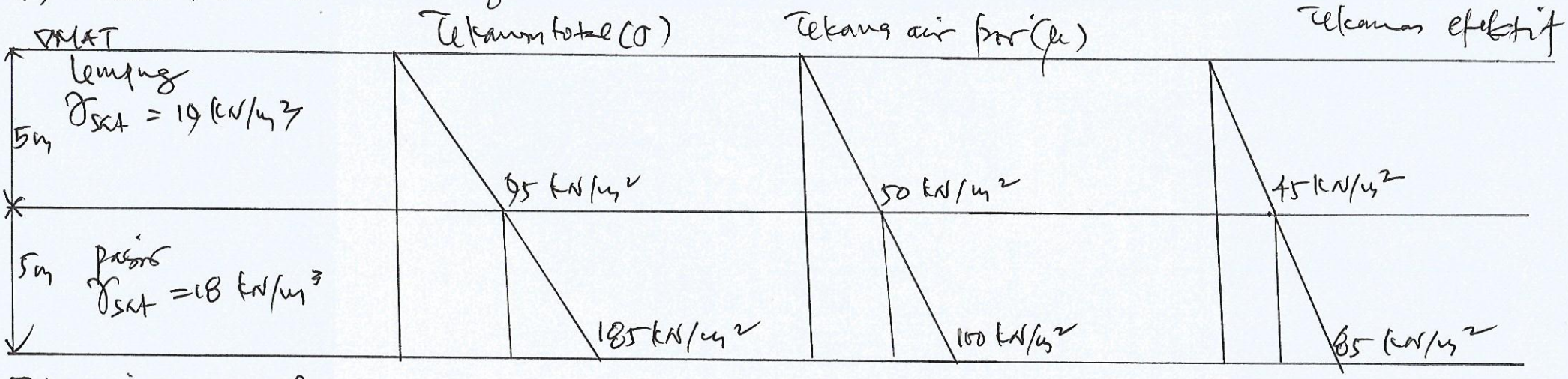
kedalaman 5 m, $\sigma' = 50\ kN/m^2$

kedalaman 10 m, $\sigma' = 145 - 50 = 95\ kN/m^2$

kedalaman 15 m, $\sigma' = 235 - 100 = 135\ kN/m^2$

Soal 3 ARHAB / 18271032

(b) setelah air kolam dihilangkan



Tek. air pori (μ) :

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

kedalaman 5 m dibawah dasar kolam, $\mu = 5.10 = 50\ kN/m^2$

kedalaman 10 m dibawah dasar kolam, $\mu = 10.10 = 100\ kN/m^2$

Tekanan total (σ) :

kedalaman 5 m, $\sigma = 5.19 = 95\ kN/m^2$

kedalaman 10 m, $\sigma = 5.19 + 5.18 = 185\ kN/m^2$

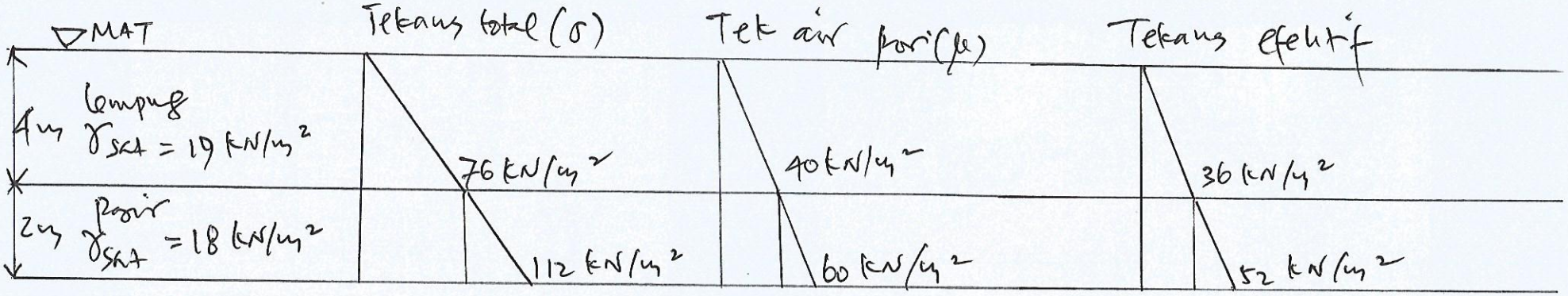
Tekanan efektif (σ'), $\sigma' = \sigma - \mu$

kedalaman 5 m, $\sigma' = 95 - 50 = 45\ kN/m^2$

kedalaman 10 m, $\sigma' = 185 - 100 = 85\ kN/m^2$

Soal 4 ARHATB/182710032

(a)



Tekanan air pori (μ) :

kedalaman 4 m, $\mu = 4 \cdot 10 = 40$ kN/m²

kedalaman 6 m, $\mu = 40 + 2 \cdot 10 = 60$ kN/m²

Tekanan total (σ) :

kedalaman 4m, $\sigma = 4 \cdot 19 = 76$ kN/m²

kedalaman 6 m, $\sigma = 76 + 2 \cdot 18 = 112$ kN/m²

Tekanan efektif (σ') : $\sigma' = \sigma - \mu$

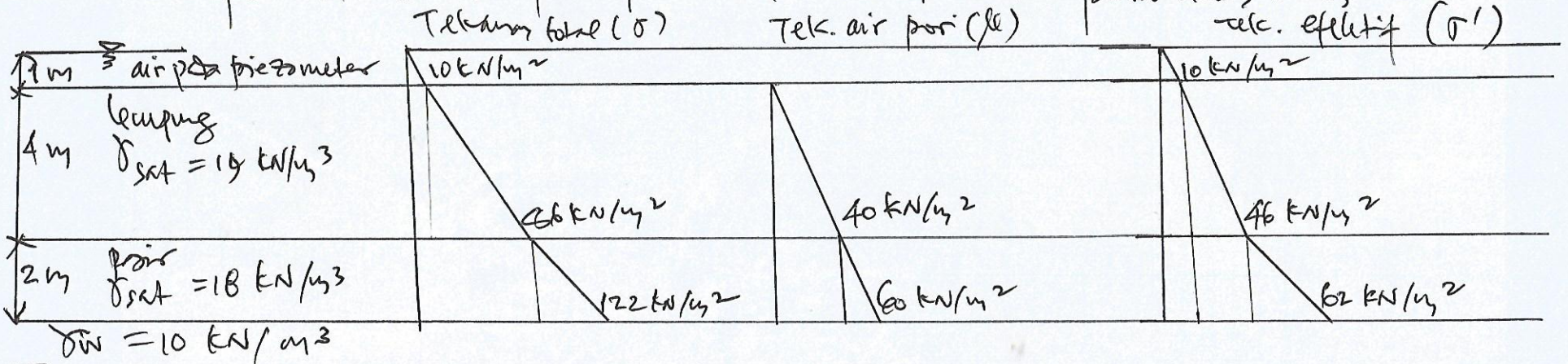
kedalaman 4 m, $\sigma' = 76 - 40 = 36$ kN/m²

kedalaman 6 m, $\sigma' = 112 - 60 = 52$ kN/m²

ARHAB/1827100032

Soal 4

(b) Bila permukaan air pada piezometer 1 m diatas permukaan tanah



Tekanan air pori (μ) :

kedalaman 1 m, $\mu = 0$

kedalaman 5 m, $\mu = 4.10 = 40\ kN/m^2$

kedalaman 7 m, $\mu = 40 + 2.10 = 60\ kN/m^2$

Tekanan total (σ) :

kedalaman 1 m, $\sigma = 1.10 = 10\ kN/m^2$

kedalaman 5 m, $\sigma = 10 + 4.16 = 86\ kN/m^2$

kedalaman 7 m, $\sigma = 86 + 2.18 = 122\ kN/m^2$

Tekanan efektif (σ'): $\sigma' = \sigma - \mu$

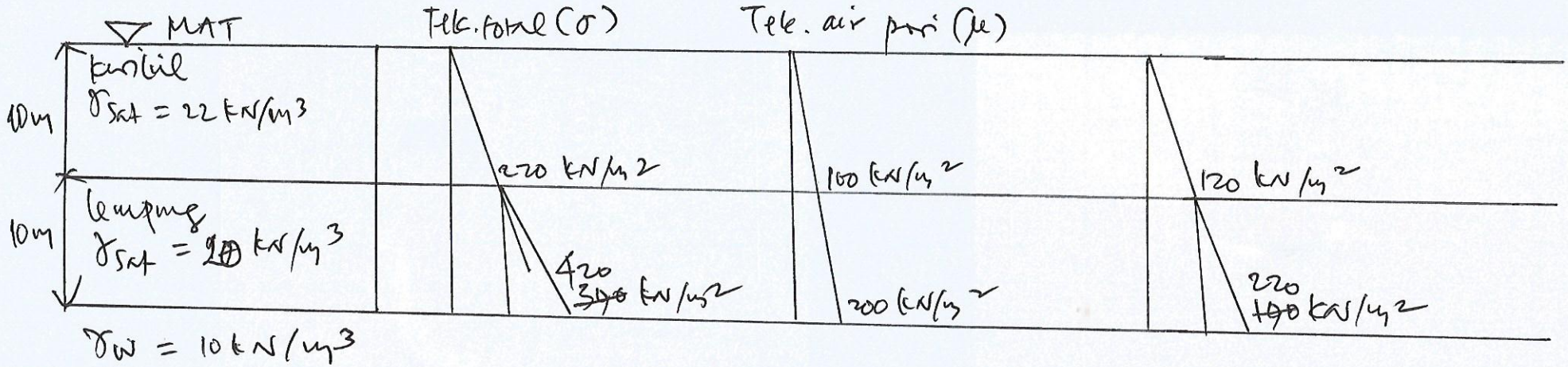
kedalaman 1 m, $\sigma' = 10\ kN/m^2$

kedalaman 5 m, $\sigma' = 46\ kN/m^2$

kedalaman 7 m, $\sigma' = 62\ kN/m^2$

Soal 5 ARHAB/18271032

(a)



Tekanan air pori (μ):

kedalaman:

10 m, $\mu = 10 \cdot 10 = 100$ kN/m²

20 m, $\mu = 100 + 10 \cdot 10 = 200$ kN/m²

Tekanan total (σ):

kedalaman:

10 m, $\sigma = 10 \cdot 22 = 220$ kN/m²

20 m, $\sigma = 220 + 10 \cdot 20 = 420$ kN/m²

Tekanan efektif (σ'): $\sigma' = \sigma - \mu$

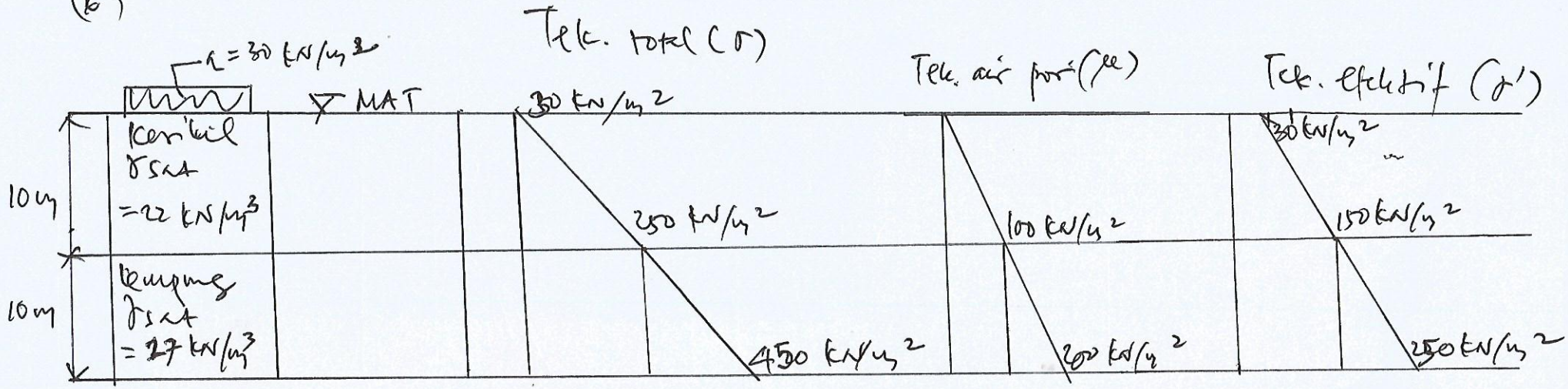
kedalaman:

10 m, $\sigma' = 120$ kN/m²

20 m, $\sigma' = 220$ kN/m²

Soal 5 ATHFAB/1827100322

(b)



$\gamma_w = 10$ kN/m³

γ_d (berat jenis kering kerikil) = 17 kN/m³

Tekanan air pori (μ):

kedalaman:

10 m, $\mu = 10 \cdot 10 = 100$ kN/m²

20 m, $\mu = 20 \cdot 10 = 200$ kN/m²

Tekanan total (σ):

kedalaman:

10 m, $\sigma = 10 \cdot 22 + 30 = 250$ kN/m²

20 m, $\sigma = 250 + 10 \cdot 20 = 450$ kN/m²

Tekanan efektif (σ'), $\sigma' = \sigma - \mu$

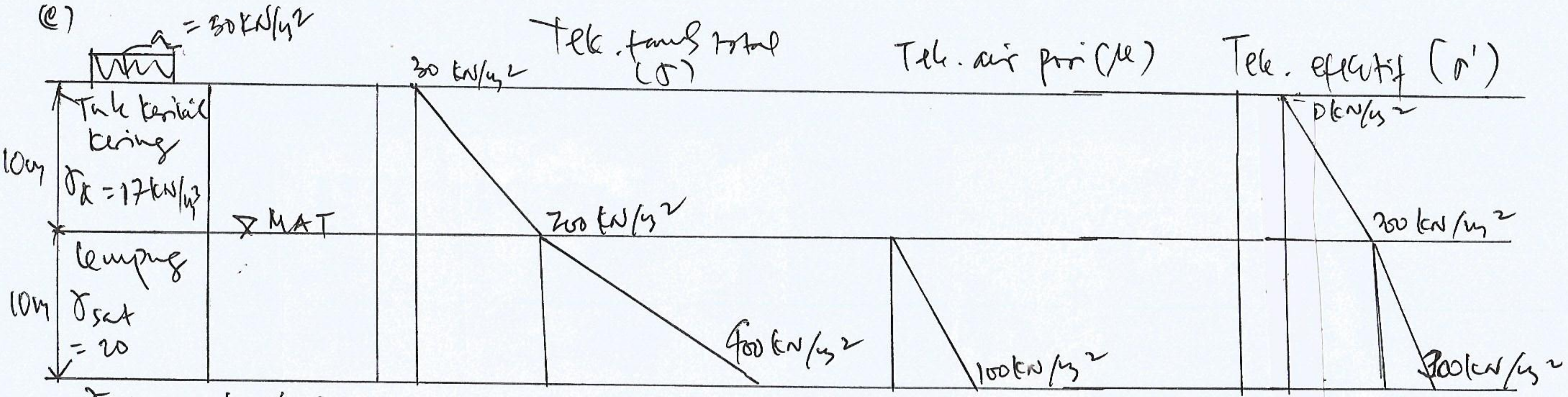
kedalaman:

10 m, $\sigma' = 250 - 100 = 150$ kN/m²

20 m, $\sigma' = 450 - 200 = 250$ kN/m³

Soal 5 ARHZAB/182710032

(e)



$\gamma_w = 10$ kN/m³

Tekanan air pori (μ):
kedalaman:

10 m, $\mu = 0$

20 m, $\mu = 10.10 = 100$ kN/m²

Tekanan total (σ):
kedalaman:

10 m, $\sigma = 30 + 10.17 = 200$ kN/m²

20 m, $\sigma = 200 + 10.20 = 400$ kN/m²

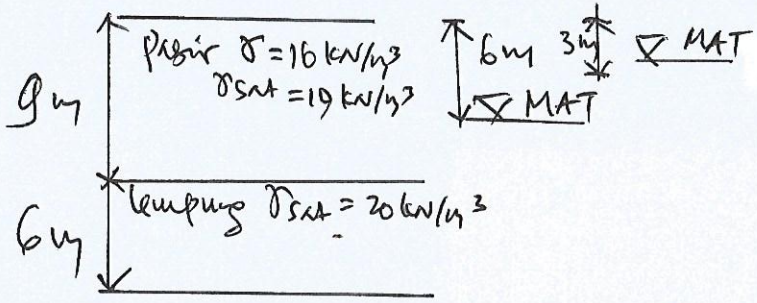
Tekanan tanah efektif (σ'): $\sigma' = \sigma - \mu$
kedalaman:

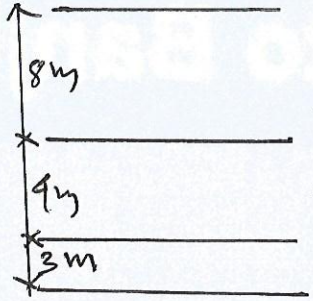
10 m, $\sigma' = 200 - 0 = 200$ kN/m²

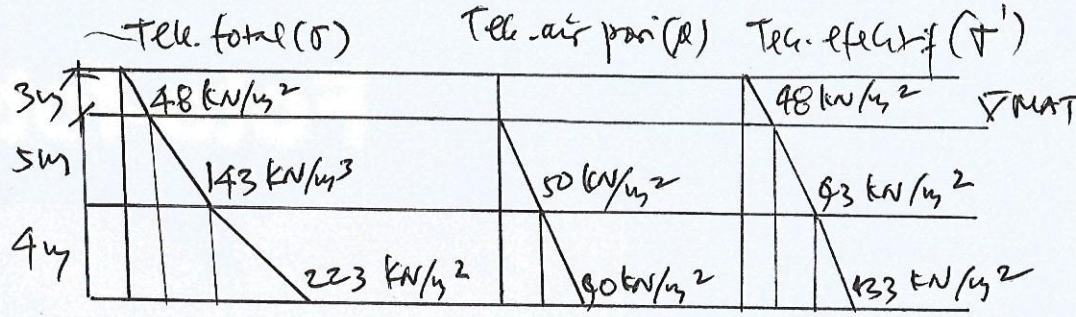
20 m, $\sigma' = 400 - 100 = 300$ kN/m²

Soal 6 ARHAB (182)10032

(a)







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

Tekanan air pori (μ):

kedalaman:

3 m, $\mu = 0$

8 m, $\mu = 5 \cdot 10 = 50\ kN/m^2$

12 m, $\mu = 9 \cdot 10 = 90\ kN/m^2$

Tekanan total (σ):

kedalaman:

3 m, $\sigma = 3 \cdot 16 = 48\ kN/m^2$

8 m, $\sigma = 48 + 5 \cdot 19 = 143\ kN/m^2$

12 m, $\sigma = 143 + 4 \cdot 20 = 223\ kN/m^2$

Tekanan efektif (σ'): $\sigma' = \sigma - \mu$

pada kedalaman:

3 m, $\sigma' = 48 - 0 = 48\ kN/m^2$

8 m, $\sigma' = 143 - 50 = 93\ kN/m^2$

12 m, $\sigma' = 223 - 90 = 133\ kN/m^2$

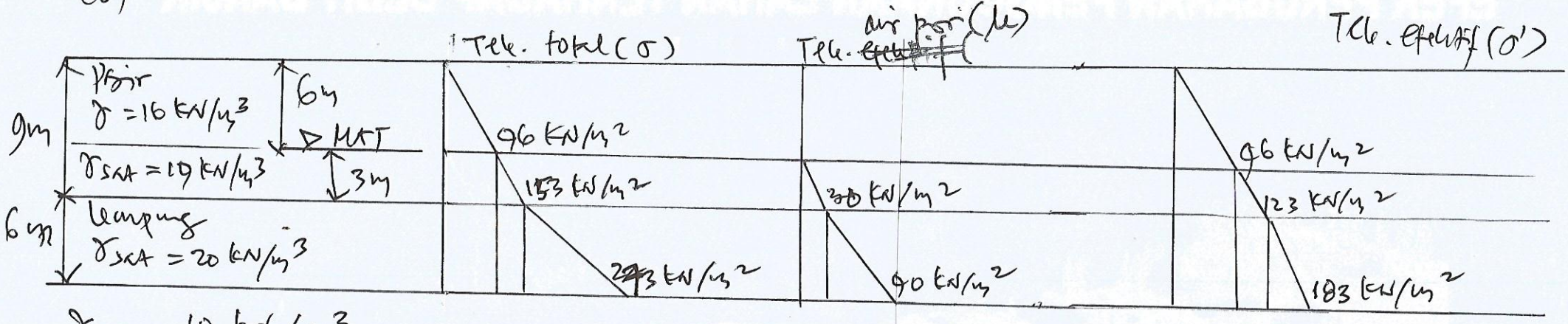
jadi Tekanan efektif pada kedalaman

8 m, $\sigma' = 93\ kN/m^2$

12, $\sigma' = 133\ kN/m^2$

Soal 6 ARHAB / 182710032

(6)



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

Tekanan air pori (μ):

kedalaman:

9m, $\mu = 3.10 = 30\ kN/m^2$

15m, $\mu = 30 + 6.10 = 90\ kN/m^2$

Tekanan total (σ):

kedalaman:

9m, $\sigma = 6.16 + 3.19 = 153\ kN/m^2$

15m, $\sigma = 153 + 6.20 = 273\ kN/m^2$

Tekanan efektif (σ'): $\sigma' = \sigma - \mu$

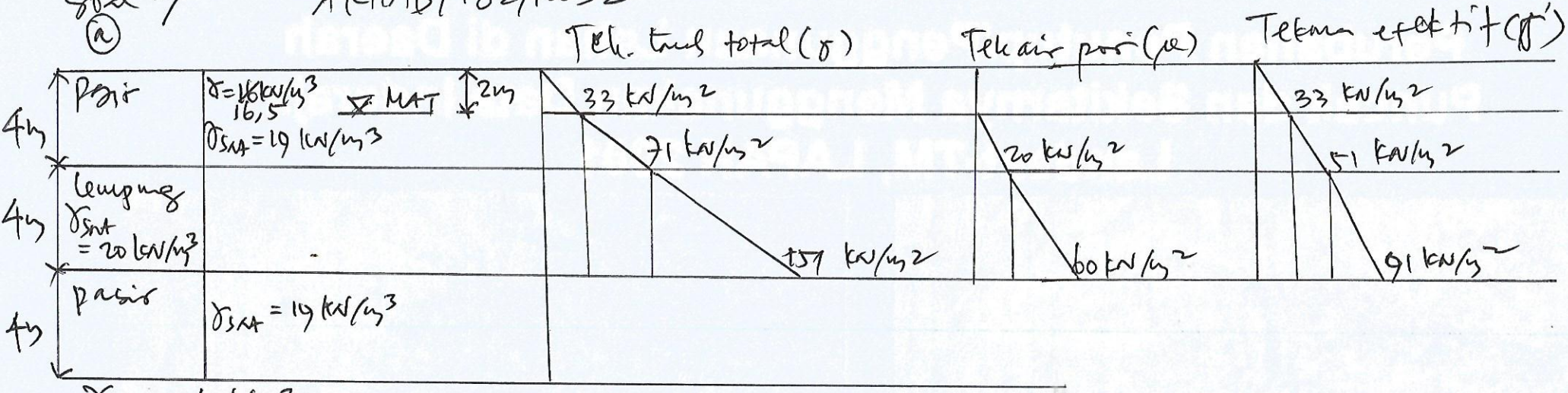
kedalaman:

9m, $\sigma' = 153 - 30 = 123\ kN/m^2$

15m, $\sigma' = 273 - 90 = 183\ kN/m^2$

Soal 7 ARHAB/18271032

(a)



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

Tekanan air pori (μ)

kedalaman :

2m, $\mu = 0$

4m, $\mu = 2 \cdot 10 = 20\ kN/m^2$

8m, $\mu = 20 + 4 \cdot 10 = 60\ kN/m^2$

12m, $\mu = 60 + 4 \cdot 10 = 100\ kN/m^2$

Tekanan Total (σ)

kedalaman :

2m, $\sigma = 2 \cdot 16,5 = 33\ kN/m^2$

4m, $\sigma = 33 + 2 \cdot 19 = 71\ kN/m^2$

8m, $\sigma = 71 + 4 \cdot 20 = 151\ kN/m^2$

12

Tekanan efektif diatas pori (σ') : $\sigma' = \sigma - \mu$

kedalaman

2m, $\sigma' = 33 - 0 = 33\ kN/m^2$

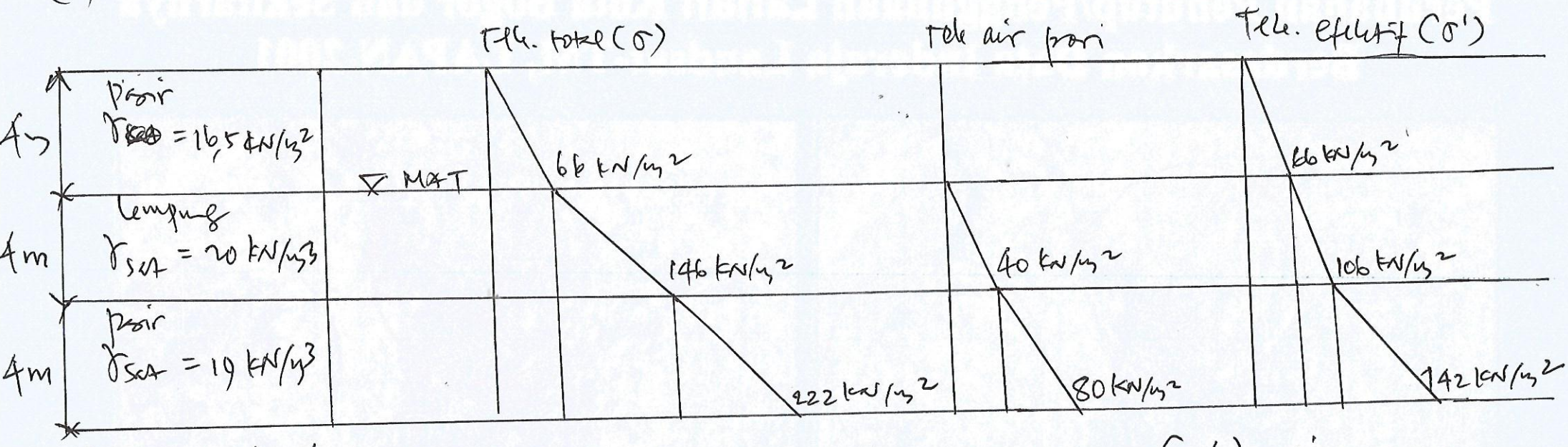
4m, $\sigma' = 71 - 20 = 51\ kN/m^2$

8m, $\sigma' = 151 - 60 = 91\ kN/m^2$

catatan :

Y kedalaman 12 m, muka air tanah pada kedalaman 4 m diatas muka tanah → jawaban (b)

Soal 7 Arhab / 182710032
(b)



$\gamma_w = 10$ kN/m³

Tekanan air pori (μ):
kedalaman:
4m, $\mu = 0$
8m, $\mu = 4.10 = 40$ kN/m²
12m, $\mu = 4.10 + 4.10 = 80$ kN/m²

Tekanan total (σ)
kedalaman:
4m, $\sigma = 4.16,5 = 66$ kN/m²
8m, $\sigma = 66 + 4.20 = 146$ kN/m²
12m, $\sigma = 146 + 4.19 = 222$ kN/m²

Tekanan efektif (σ'): $\sigma' = \sigma - \mu$
kedalaman:
4m, $\sigma' = 66 - 0 = 66$ kN/m²
8m, $\sigma' = 146 - 40 = 106$ kN/m²
12m, $\sigma' = 222 - 80 = 142$ kN/m²

Pada kedalaman dibawah pasir lanau → Tekanan efektif
= 142 kN/m²

Kuliah III

Nama : Dadik Utomo

NIM: 182710036

TUGAS 2 REKAYASA GEOTEKNIK LANJUT

1. Jelaskan proses yang terjadi dalam pembentukan tanah. Sebutkan dua jenis tanah yang terhasilkan akibat proses pembentukan tanah tersebut

   Tahap pertama dari proses pembentukan tanah adalah proses pelapukan. Proses ini terjadi penghancuran dan pelembutan dari bahan induk tanpa perubahan susunan kimianya. Pelapukan dipengaruhi oleh faktor iklim yang bersifat merusak. Faktor-faktor iklim yang turut menentukan adalah sinar matahari, perbedaan temperatur antara siang dan malam, keadaan musim kemarau dan musim penghujan. T**anah** merupakan bagian **dari** permukaan bumi yg terbentuk **dari proses** pelapukan baik pelapukan batuan maupun bahan organik seperti sisa tumbuhan **dan** hewan. pelapukan yg menyebabkan terbentuknya **tanah** yaitu berupa pelapukan fisis, kimiawi **dan** biologi

   Berikut jenis- jenis tanah di Indonesia dan penjelasannya.

   a) **Tanah** Aluvial. **Tanah** aluvial ini merupakan **jenis tanah** yang terjadi karena endapan lumpur yang biasanya terbawa aliran sungai. ...
   b) **Tanah** Andosol. ...
   c) **Tanah** Entisol. ...
   d) **Tanah** Grumusol. ...
   e) **Tanah** Humus. ...
   f) **Tanah** Inceptisol. ...
   g) **Tanah** Laterit. ...
   h) **Tanah** Liat.

2. Berdasarakan distribusi ukuran butiran, maka tanah dapat diklasifikasikan sebagai Kerikil, Pasir, Lanau dan Lempung. Jelaskan perbedaan perilaku tanah tersebut dalam konteks reaksi terhadap pembebanan dan juga terhadap keberadaan air. Jelaskan juga perbedaan dari segi parameter kekuatan tanah.

   klasifikasi *tanah* dengan terpokus referensi braja m das. ... pembagian *ukuran butir* : 20% *kerikil*, 1 0% *pasir*, 30% *lanau*, dan 40% *lempung*, ... Sistem Klasifikasi AASHTO Pada sistem ini, *tanah diklasifikasikan* ke *dalam* tujuh ... di mana 35% atau kurang *dari* jumlah butiran *tanah tersebut* lolos ayakan No.

3. Sebutkan jenis mineral lempung berdasarkan reaktifitasnya terhadap keberadaan air. Jelaskan bagaimana kandungan mineral dapat mempengaruhi perilaku tanah lempung.
   mineral lempung ilit-monmorilonit yang bersifat ekspansif, serta *berdasarkan* berbagai analisis ... dengan kontak material lempung dengan *air*. ... mengetahui *keberadaan* lempung

ekspansif ... pemahaman dan kewaspadaan *dalam* melakukan ... d. beberapa analisis klasifikasi (*jenis* tanah

4. Masalah apa yang mungkin anda hadapi bila berhadapan dengan tanah ekspansif dan apakah metode stabilisai yang PALING sesuai dengan tanah ekspansif. Jelaskan.
   adalah untuk mengetahui tentang perilaku *tanah ekspansif* (expansive soil) pada ... *masalah* terutama yang berkeanaan dengan daya dukung tanah. ... *Apabila* terjadi peningkatan kadar air tanah akan mengembang disertai dengan ... pemilihan jenis *metode stabilisasi* yang cocok ditentukan berdasarkan ukuran butir
5. Masalah apa yang mungkin anda hadapi bila berhadapan dengan tanah gambut dan apakah metode stabilisasi yang TIDAK sesuai dengan tanah gambut. Jelaskan sebab tidak sesuai.
   cadangan karbon dalam *tanah gambut* bersifat labil, jika kondisi alami lahan ... Lahan gambut tropika umumnya tergolong *sesuai* marginal untuk ... *Metode* penentuan tingkat kematangan gambut di lapangan ... *Stabilitas* bahan gambut yang dominan berasal dari ikatan CHO secara ... *Masalah* tanaman di lahan gambut
6. Sebutkan dua jenis pengujian permeabilitas tanah di laboratorium. Jelaskan perbedaan antara ke dua metode tersebut.
   Permeabillitas

   Cepat atau lambanya air meresap ke dalam tanah melalui pori pori tanah

   Drainase

   Kemampuan tanah mengalirkan dan mengatuskan kelebihan air
7. Apa yang terjadi selama proses pemadatan tanah. Jelaskan dengan menggunakan diagram fasa.
   Pemadatan tanah adalah *proses* naiknya kerapatan tanah dengan memperkecil jarak antar partikel sehingga *terjadi* reduksi volume udara : tidak *terjadi* perubahan volume air yang cukup berarti pada tanah tersebut
   Diagram Fasa. ... **Diagram fasa** adalah **diagram** yang menggambarkan perubahan bentuk suatu zat pada berbagai keadaan tekanan dan suhu. **Diagram fasa** atau **diagram** P-T adalah **diagram** yang menyatakan hubungan antara suhu dan tekanan dengan **fase** zat. Setiap zat cair pada suhu tertentu mempunyai tekanan uap jenuh tertentu.
8. Ada tiga properties yang dapat ditentukan berdasarkan hasil pengujian fisik tanah yaitu Specific gravity, berat jenis dan kadar air. Dari ke tiga properties ini kita dapat menghitung 6 properties lainnya. Umpama kadar air w = 35%, Specific gravity Gs = 2.70 dan berat jenis = 18. Maka tentukan angka pori e, porositas , dan derajat kejenuhan Sr.

9. Sebutkan jenis jenis pondasi bangunan yang anda ketahui. Jelaskan kriteria disain untuk ke dua jenis pondasi tersebut.
   - Jenis **Pondasi** Tapak.
   - **Pondasi** Sumuran.

Pondasi *bangunan* adalah kontruksi yang paling terpenting pada ... *Kriteria* daya dukung tanah *tersebut* dapat ditentukan melalui ... *Jenis pondasi* dibagi menjadi 2, yaitu pondasi dangkal dan pondasi dalam. 1. ... belum benar itu lihat dulu kadar air tanah yang terkandung baru di *ketahui* kadar air nya baru

10. Jelaskan beberapa kondisi dimana pondasi tiang harus dipilih dalam perencanaan pondasi suatu bangunan.

    Ada *beberapa* faktor *dalam* pemilihan *pondasi*,antara lain beban yang direncanakan ... Jenis *pondasi* yang *dipilih harus* mampu menjamin kedudukan struktur terhadap ... Ditinjau *dari* segi pelaksanaan, ada *beberapa* keadaan *dimana kondisi* ... 2.1.4 *Pondasi Tiang Pondasi tiang* adalah *suatu* konstruksi *pondasi* yang