

PELAJARI PENGERJAAN SOAL SOAL DI BAWAH INI DAN TULIS KEMBALI JAWABAN ANDA

Example Problem 3.2

A retaining structure is supporting a 5.3 m high excavation. This wall has moved sufficiently to develop active condition. The properties of the soil behind retaining wall are $c' = 0$; $\phi' = 30^\circ$; $\gamma_b = 20.4 \text{ kN/m}^3$, $\gamma_{sat} = 22.0 \text{ kN/m}^3$. Compute the lateral pressure distribution acting on this wall if ground water table exist at 2.5 m below ground surface. Assume that the back of the wall is smooth so that the wall friction angle $\delta = 0$.

Solution

Use Rankine's theory $K_a = \tan^2(45 - 30/2) = 0.333$

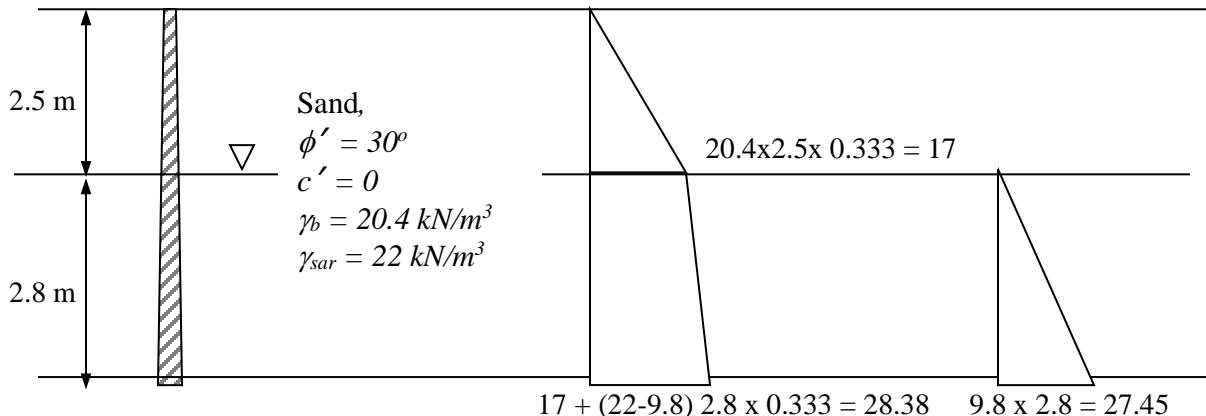


Figure P3.2

- a. Lateral earth pressure (see diagram)

$$P_a = \frac{1}{2} \times 17 \times 2.5 + 17 \times 2.8 + \frac{1}{2} \times 11.38 \times 2.8$$

$$P_a = 21.25 + 47.6 + 15.93$$

$$P_a = 84.78 \text{ kN}$$

- b. Hydrostatic pressure (see diagram)

$$P_w = \frac{1}{2} \times 27.45 \times 2.8$$

$$P_w = 38.43 \text{ kN}$$

$$\text{Total horizontal pressure on wall} = P_a + P_w = 84.78 + 38.43 = 123.2 \text{ kN}$$

Example Problem 3.4

A retaining structure is supporting a 6 m high excavation as shown in Figure P3.4. The wall moves sufficiently that active condition prevail behind the wall. Fill of dry sand of 1 m height was placed in front of the wall in order to reduce the movement. The dry unit weight of the sand fill was 18.5 kN/m³. (a) determine the active thrust force P_a working on the wall, and (b) determine the passive force induced by the sand fill in front of the wall, (c) if the passive thrust were 100% mobilized, is the 1 m sand fill sufficient to retain the movement of the wall (use horizontal force equilibrium).

Solution

Use Rankine's theory

$$K_a = \tan^2 (45 - \frac{\phi}{2}) = 0.406$$

$$K_p = \frac{1}{K_a} = 2.46$$

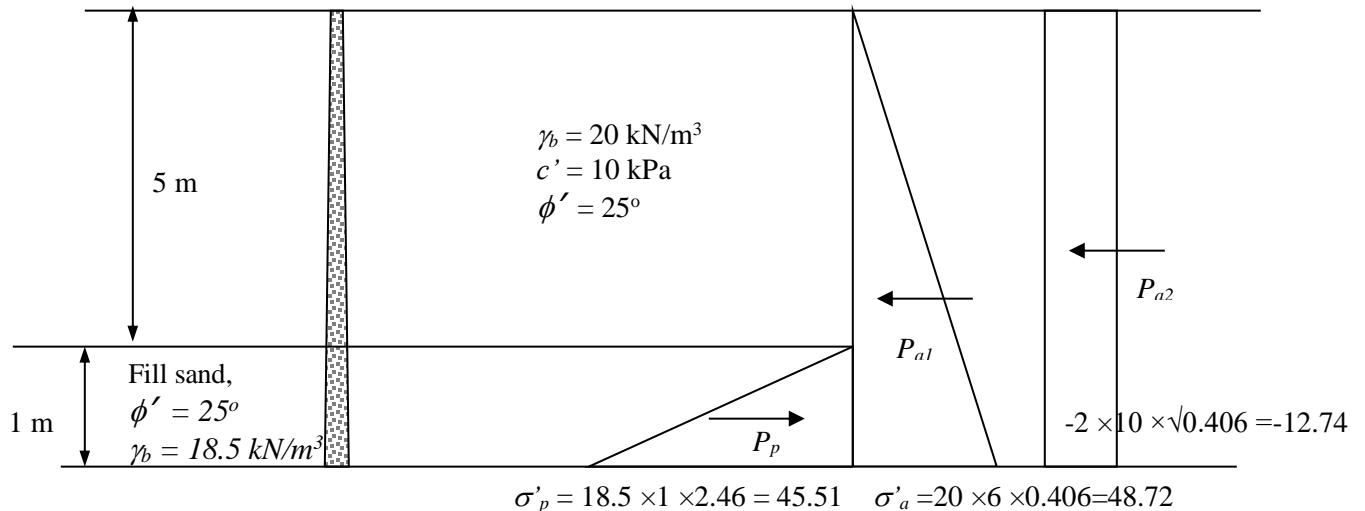


Figure P3.4

- Active force (see diagram)

$$P_a = \frac{1}{2} \times 48.72 \times 6 - 12.74 \times 6 = 146.16 - 76.44 = 69.72 \text{kN}$$

- b. Passive force (see diagram)

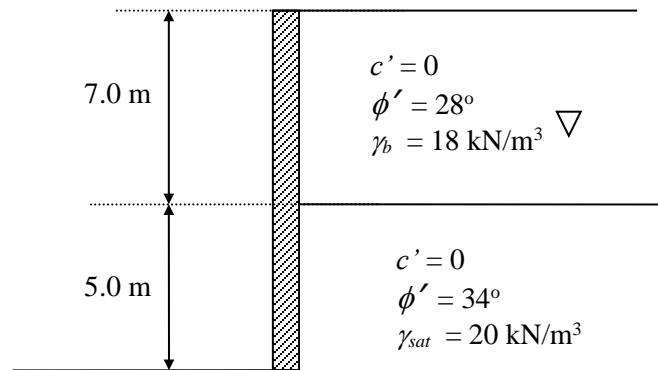
$$P_p = \frac{1}{2} \times 45.51 \times 1 = 27.76 \text{kN}$$

$P_a > P_p \rightarrow$ The sand fill is not sufficient to resist wall movement

KERJAKAN SOAL SOAL DIBAWAH INI

- 3.1. A wall is required to retain a cut on a cohesionless soil which has a unit weight of 18.4 kN/m^3 and effective internal friction angle ϕ' of 25° . The height of the cut is 3 m. If the wall is very rigid and the soil is in “at rest” condition (a) Draw the diagram of lateral pressure behind the wall (b) Calculate the magnitude and point of application of the thrust force on a wall
- 3.2. An excavation was to be made on a cohesive soil with unit weight $\gamma_b = 19.2 \text{ kN/m}^3$; $c' = 10 \text{ kPa}$, and $\phi' = 10^\circ$. Calculate the depth of unsupported excavation. Plot the active earth pressure diagram if the excavation was to be made up to 9 m deep, and calculate the resulting force and point of application.
- 3.3. A vertical wall retaining a 3 m high dry sand with unit weight 18 kN/m^3 , and internal friction angle $\phi' = 36^\circ$. What is the thrust force working on the wall if uniform surcharge load of 10 kN/m^2 was placed on the surface of the soil behind the wall. Active condition prevails.
- 3.4. A concrete wall is designed to retain a cohesionless soil with the following properties: $\gamma = 20.4 \text{ kN/m}^3$; $\phi' = 35^\circ$; $c' = 0$, $\delta = 20^\circ$. Determine the active thrust force acting on the wall if the height of the wall is 4.6 m and the backfill soil form an angle of 10° to the horizontal.
- 3.5. A retaining wall as shown in figure Q3.4 retains soil for a depth of 12 m. The soil mass consists of two layers with soil properties given in the figure. Water table coincide the interface between layer 1 and 2. (a) determine the magnitude and point of application of the active thrust; (b) determine also the hydrostatic pressure working on the back of the wall.

Figure Q3.4



NAMA : DESMARITA

NIM : 182710025

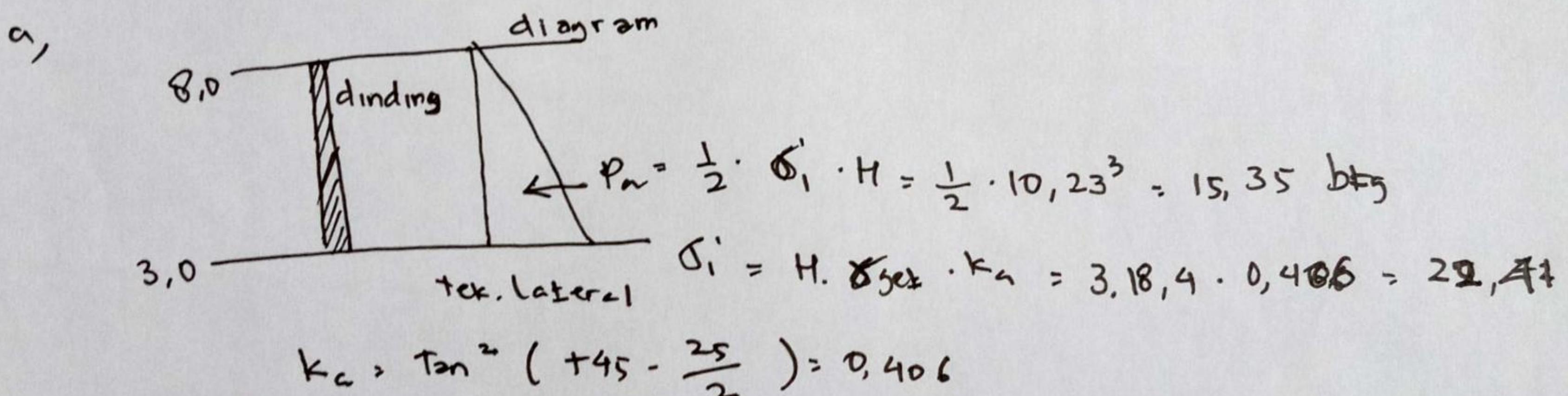
MATAKULIAH : REKATASA GEOTEKNIK LANJUTAN

TUGAS 4.

SOAL 3.1

- $18,4 \text{ kN/m}^3$ ~~σ₁~~ Dinding pada tanah korosi
- $25^\circ = \phi \rightarrow$ Sudut gesekan Internal off
- ketinggian Potongan 3 m
- Jika dinding sangat kaku dan tanah dalam kondisi diam
a, Gambar diagram tekanan lateral di belakang dinding
b, Hitung besarnya dan titik penerapan gaya dorong pada dinding.

Jawab



b, Tek. tanah aktif

$$\sigma_a = \frac{1}{2} \cdot \sigma_i \times H_i \\ = \left(\frac{1}{2} \cdot 3,41 \right) \times 3$$

$$\sigma_a = x \cdot H_i \times k_a \\ = 84,3 \times 0,406 \\ = 3,41$$

3.2. Dit: excavation was to be made on cohesive soil

$$\gamma_b = 19,2 \text{ kN}$$

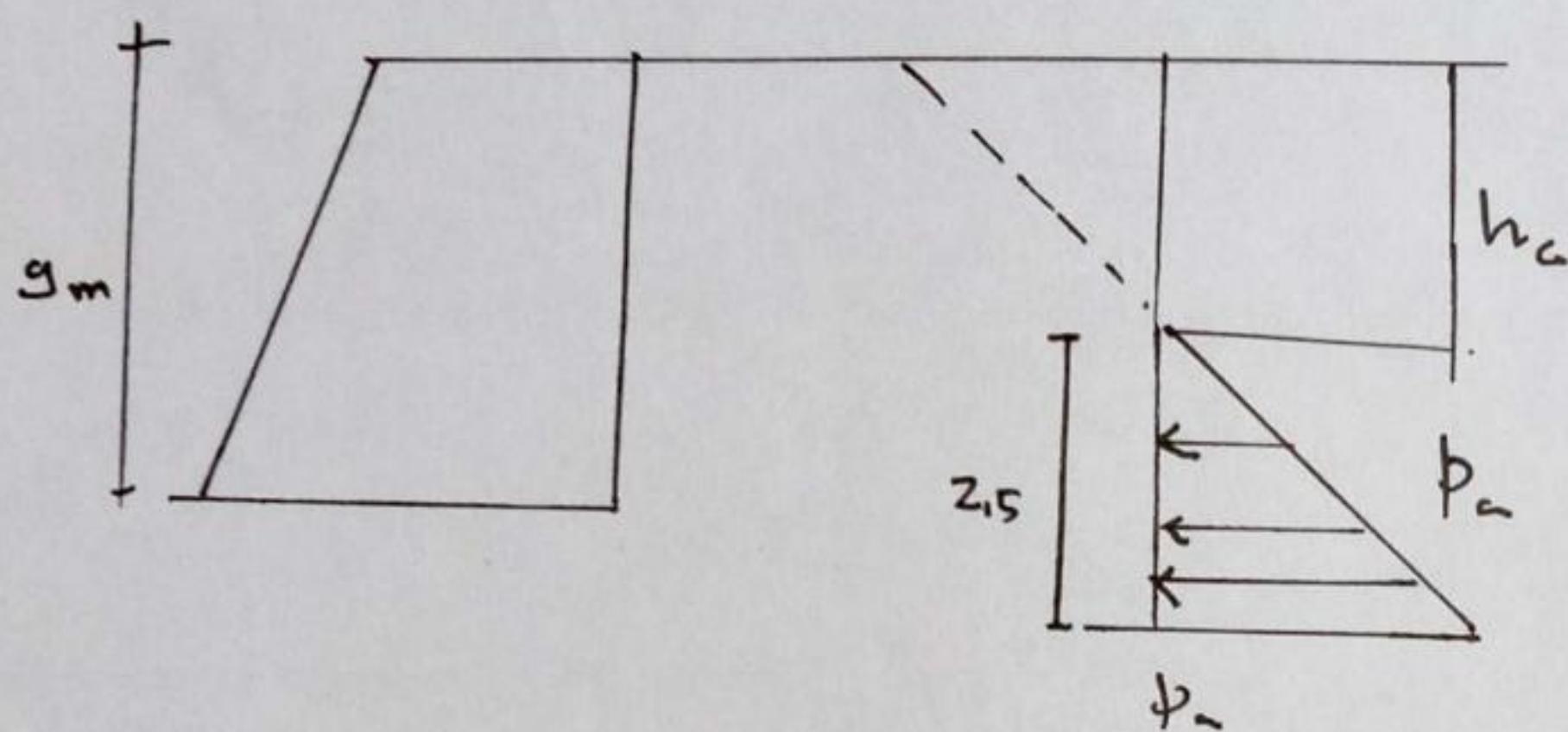
$$c' = 10 \text{ kPa}$$

$$\phi' = 10^\circ$$

Dit: plot the active pressure if the excavation was to be made up $H = 9 \text{ m}$

- calculate resulting force and point of application

Solution



Rankine's theory:

$$\begin{aligned} k_a &= \tan^2(45^\circ - \frac{\phi}{2}) \\ &= \tan^2(40^\circ) \\ &= 0,70 \end{aligned} \quad \begin{aligned} \sqrt{k_a} &= \sqrt{0,70} \\ &= 0,84 \end{aligned}$$

Reduction of active pressure due to the effect of cohesion

$$\begin{aligned} -2c\sqrt{k_a} &= -2 \cdot 10 \cdot 0,84 \\ &= -16,8 \text{ kN/m}^2 \end{aligned}$$

Tekanan Tanah Aktif pada Cluster Zinding:

$$\begin{aligned} p_a &= \gamma_b \cdot H \cdot k_a - 2c\sqrt{k_a} \\ &= 19,2 \cdot 9 \cdot 0,7 - 16,8 \\ &= 104,16 \text{ kN/m}^2 \end{aligned}$$

Kedalaman Retakan

$$h_c = \frac{2c}{\gamma_b \cdot \sqrt{k_a}} = \frac{2(10)}{19,2 \cdot 0,84}$$

$$= 1,24$$

Tek. Tanah Aktif Total

$$\begin{aligned} p_a &> \frac{1}{2} \cdot (104,16) \cdot (9 - 1,24) \\ &= 404,14 \text{ kN/m} \end{aligned}$$

$$\begin{aligned} \text{Titik Tangkap} &= (9 - 1,24) / 3 \\ &= 2,58 \text{ dari dasar} \\ &\text{zinding.} \end{aligned}$$

3.4 / . Dik: struktur Retakan tanah Tinggi = 6,0 m

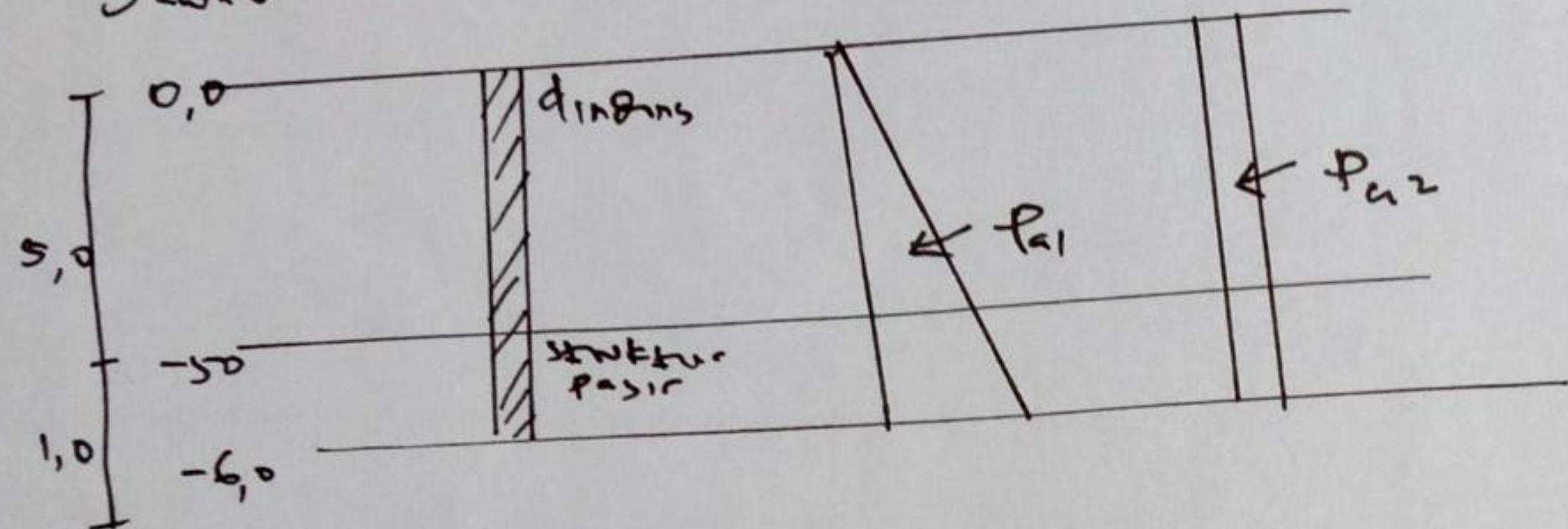
- Di depan dinding ke pasir tinggi 1m

$$\gamma_a = 18,5 \text{ kN/m}^3$$

Dit: a. Tentukan Gaya dorong aktif P_a

b. Jika gaya dorong pasif 100% adalah pasir
4 m ψ , retakan di depan dinding

Diketahui



Gaya tanah aktif / P_a

$$P_a = \left(\frac{1}{2} \cdot \phi'_a \right) \times (H - r_a^2) \times L$$

$$= \left(\frac{1}{2} \cdot 48,72 \right) \times (6 - 12,74) \times 4$$

$$= 146,16 - 76,72$$

$$= 69,44 \text{ kN/m}^2$$

$$\phi'_a = \gamma_b \cdot H \cdot f_a \\ = 20,6 \cdot 0,406 \\ = 48,72 \text{ kN}$$

$$k_a = \tan^2 \left(+45 - \frac{\psi}{2} \right) \\ = 0,406$$

$$\phi_a^2 = -2 \cdot C' \cdot \sqrt{k_a} \\ = -2 \cdot 10 \times \sqrt{0,406}$$

$$\approx -12,74 \text{ kN/m}^3$$

Gaya tanah pasif / P_p

$$= P_p = \frac{1}{2} \cdot \phi'_p \cdot H_2$$

$$= \frac{1}{2} \cdot 45,51 \cdot 1$$

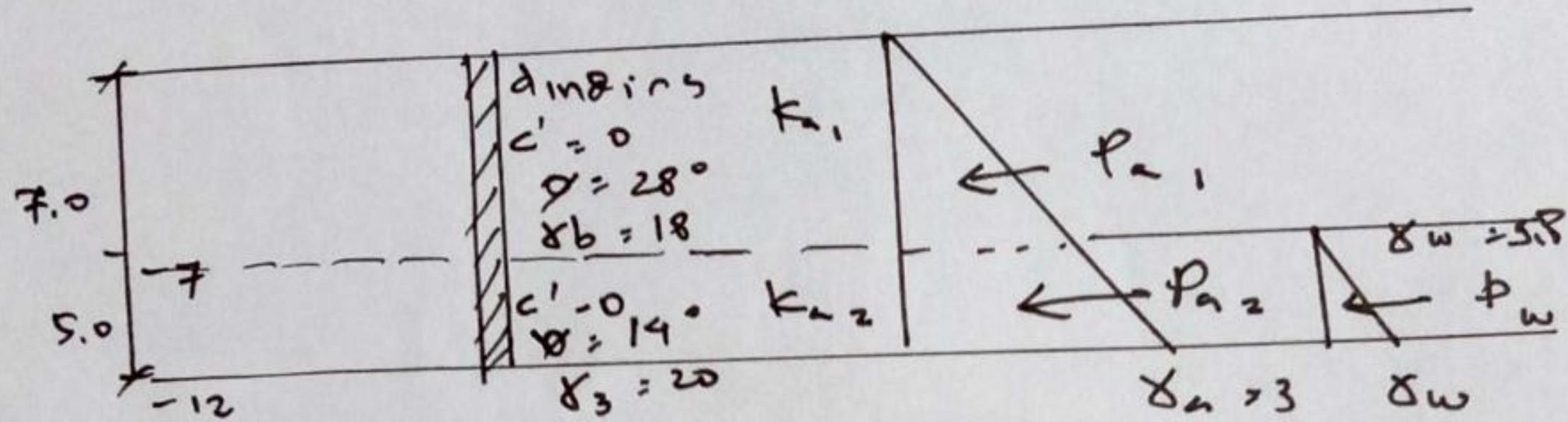
$$= 22,76 \text{ kN/m}^2$$

$$\phi'_p = \gamma_b \cdot H_1 \cdot k_p \quad / \quad K_p = \frac{1}{K_a} = \frac{1}{0,406} = 2,46 \\ = 18,5 \times 2,46 \\ = 45,51 \text{ kN/m}^3$$

$P_a > P_p \rightarrow$ Pasir tidak kuat menahan gerakan dinding.

- 3.5 DIK: Dinding Penahan Tanah = 12 m
 Macam tanah 2 lapisan dengan sifat tanah pada gambar
- Dit.: a. Tentukan dorongan tanah aktif
 b. Tentukan tekanan hidrolik di belakang dinding

Jwb.



$$\text{Rangkaian} = P_{a1} = H_1 \cdot \gamma_b \cdot \delta_{a1}$$

$$= 7,0 \cdot 18 \cdot 45,99$$

$$= 159,20 \text{ kN/m}^3$$

~~$$\delta_{a1} = H_1 \cdot \gamma_b \cdot k_{a1}$$~~
~~$$k_{a1} = \frac{1}{2} (45 - 18)$$~~

$$k_{a1} = \gamma_b \cdot \left(45 - \frac{\phi}{2}\right)$$

$$= 45 - \frac{38}{2}$$

$$= 0,361$$

$$\delta_{a1}' = 7,0 \cdot 18 \cdot 0,361$$

$$= 45,99 \text{ kN/m}^3$$

$$P_{a2} = H_1 \cdot \gamma_b \cdot (\delta_{a2} + \delta_{a3})$$

$$= 7,0 \cdot 20 (35,66 + 63,96)$$

$$= 249,05 \text{ kN/m}^3$$

$$\delta_{a2} = H_1 \cdot \gamma_b \cdot k_{a2}$$

$$= 7,0 \cdot 18 \cdot 0,283$$

$$= 35,66 \text{ kN/m}^3$$

$$\delta_{a3} = H_2 \cdot \gamma_b \cdot k_{a3} + \delta_{a2}$$

$$= 5,0 \cdot 20 \cdot 0,283 + 35,66$$

$$= 63,96 \text{ kN/m}^3$$

$$\gamma_w = \frac{1}{2} \cdot H_2 \cdot \gamma_w$$

$$= \frac{1}{2} \cdot 5 \cdot 49,05$$

$$= 122,625 \text{ kN/m}^3$$

$$\gamma_w = H_2 \cdot \gamma_w$$

$$= 5 \cdot 49,05$$

$$= 245,25 \text{ kN/m}^3$$

SOAL NO 1

Diketahui :

$$h_1 = 3,0 \text{ m}$$

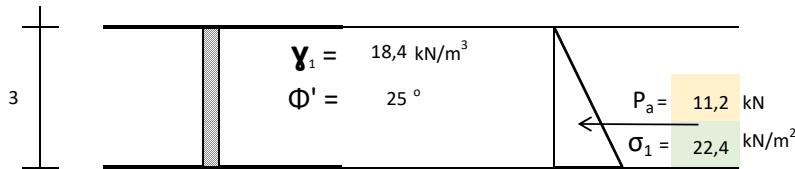
$$\gamma_1 = 18,4 \text{ kN/m}^3$$

$$\Phi' = 25^\circ$$

Nama : Idwan Rozanova

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Penyelesaian : 1.A Diagram Tekanan Tanah



Penyelesaian : 1.B Tekanan Tanah Aktif

$$K_a = \tan^2(45 - \Phi'/2) = 0,406$$

$$\sigma_1 = h_1 \cdot \gamma_1 \cdot K_a = 22,4 \text{ kN/m}^2$$

$$P_a = 1/2 \cdot \sigma_1 \cdot h_1 = 11,2 \text{ kN}$$

SOAL NO 2

Diketahui :

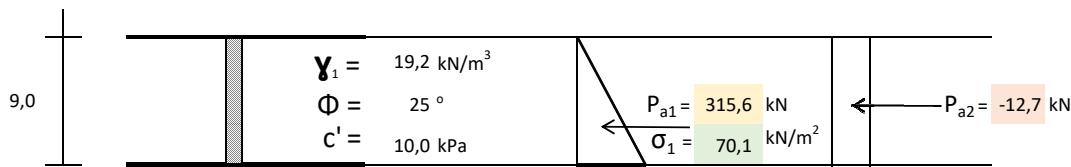
$$h_1 = 9,0 \text{ m}$$

$$\gamma_1 = 19,2 \text{ kN/m}^3$$

$$\Phi' = 25^\circ$$

$$c' = 10,0 \text{ kPa}$$

Penyelesaian : 2.A Diagram Tekanan Tanah



Penyelesaian : 2.B Tekanan Tanah Aktif

$$K_a = \tan^2(45 - \Phi'/2) = 0,406$$

$$\sigma_1 = h_1 \cdot \gamma_1 \cdot K_a = 70,1 \text{ kN/m}^2$$

$$P_{a1} = 1/2 \cdot \sigma_1 \cdot h_1 = 315,6 \text{ kN}$$

$$P_{a2} = -2 \cdot c' \cdot \sqrt{K_a} = -12,74 \text{ kN}$$

$$P_a \text{ Total} = 302,9 \text{ kN}$$

SOAL NO 3

Diketahui :

$$h_1 = 3,0 \text{ m}$$

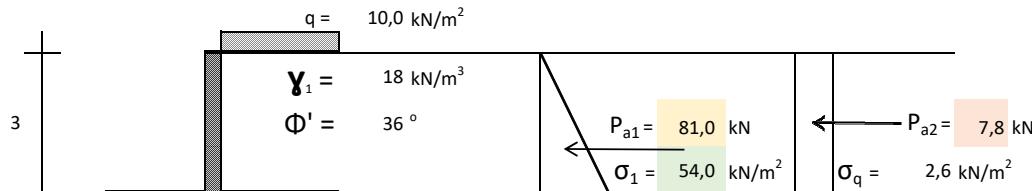
$$\gamma_1 = 18 \text{ kN/m}^3$$

$$\Phi' = 36^\circ$$

$$q = 10,0 \text{ kN/m}^2$$

Nama : Idwan Rozanova
NIM : 182710028

Penyelesaian : 3.A Diagram Tekanan Tanah



Penyelesaian : 3.B Tekanan Tanah Aktif

$$K_a = \tan^2(45 - \Phi/2) = 0,260$$

$$\sigma_1 = h_1 \cdot \gamma_1 \cdot K_a = 54,0 \text{ kN/m}^2$$

$$\sigma_q = q \cdot K_a = 2,6 \text{ kN/m}^2$$

$$P_{a1} = 1/2 \cdot \sigma_1 \cdot h_1 = 81,0 \text{ kN}$$

$$P_{a2} = \sigma_q \cdot h = 7,8 \text{ kN}$$

$$P_a \text{ Total} = 88,8 \text{ kN}$$

SOAL NO 4

Diketahui :

$$h_1 = 4,6 \text{ m}$$

$$\gamma_1 = 20,4 \text{ kN/m}^3$$

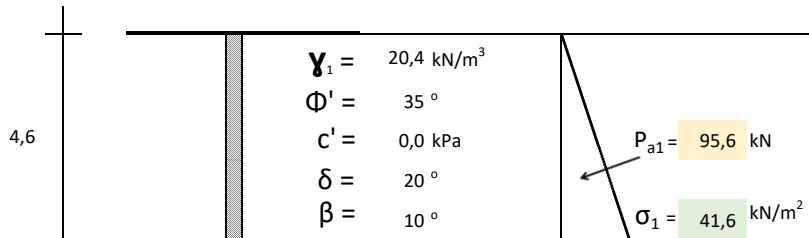
$$\Phi' = 35^\circ$$

$$c' = 0,0 \text{ kPa}$$

$$\delta = 20^\circ$$

$$\beta = 10^\circ$$

Penyelesaian : 2.A Diagram Tekanan Tanah



Penyelesaian : 2.B Tekanan Tanah Aktif

$$K_a = \frac{\sin^2(90 - \Phi)}{\sin^2 90 \cdot \sin(90 - \delta) \left[1 + \sqrt{\frac{\sin(\Phi' - \delta) \cdot \sin(\Phi' - \beta)}{\sin(90 - \delta) \cdot \sin(90 + \beta)}} \right]}$$

$$K_a = 0,443$$

$$\sigma_1 = h_1 \cdot \gamma_1 \cdot K_a = 41,6 \text{ kN/m}^2$$

$$P_{a1} = 1/2 \cdot \sigma_1 \cdot h_1 = 95,6 \text{ kN}$$

SOAL NO 5

Diketahui :

$$h_1 = 7,0 \text{ m}$$

$$\gamma_1 = 18 \text{ kN/m}^3$$

$$h_2 = 5,0 \text{ m}$$

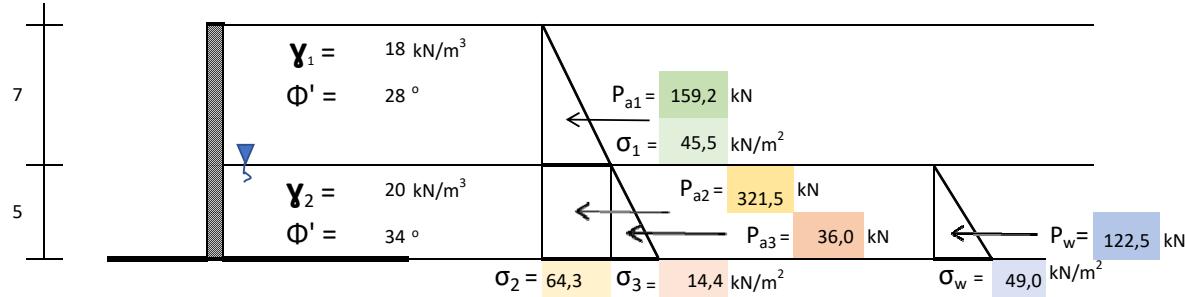
$$\phi' = 28^\circ$$

$$\gamma_2 = 20 \text{ kN/m}^3$$

$$\phi' = 34^\circ$$

Nama : Idwan Rozanova
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Penyelesaian : 5.A Diagram Tekanan Tanah



Penyelesaian : 5.B Tekanan Tanah Aktif

$$K_{a1} = \tan^2(45 - \phi'/2) = 0,361$$

$$K_{a2} = \tan^2(45 - \phi'/2) = 0,283$$

$$\text{Tekanan Tanah } \sigma_1 = h_1 \cdot \gamma_1 \cdot K_{a1} = 45,5 \text{ kN/m}^2$$

$$\sigma_2 = \sigma_1 \cdot h_2 \cdot K_{a2} = 64,3 \text{ kN/m}^2$$

$$\sigma_3 = h_2 \cdot (\gamma_1 - 9,8) \cdot K_{a2} = 14,4 \text{ kN/m}^2$$

$$\text{Tekanan Air } \sigma_w = h_2 \cdot \gamma_w = 49,0 \text{ kN/m}^2$$

$$\text{Tekanan Tanah Total } P_{a1} = 1/2 \cdot \sigma_1 \cdot h_1 = 159,2 \text{ kN}$$

$$P_{a2} = \sigma_2 \cdot h_2 = 321,5 \text{ kN}$$

$$P_{a3} = 1/2 \cdot \sigma_3 \cdot h_2 = 36,0 \text{ kN}$$

$$P_w = 1/2 \cdot \sigma_w \cdot h_2 = 122,5 \text{ kN}$$

$$P_a \text{ Total} = 639,3 \text{ kN}$$

Nama : M. Nasrullah.
 NIM : 182710034
 Mata Kuliah : Retekayasa Geoteknik Lanjut (Tugas 4)

3) Dik : $\gamma = 18.4 \text{ KN/m}^3$

$$\phi' = 25^\circ$$

Cohesionless soil \rightarrow tanah non kohesif

$$H = 3 \text{ m}$$

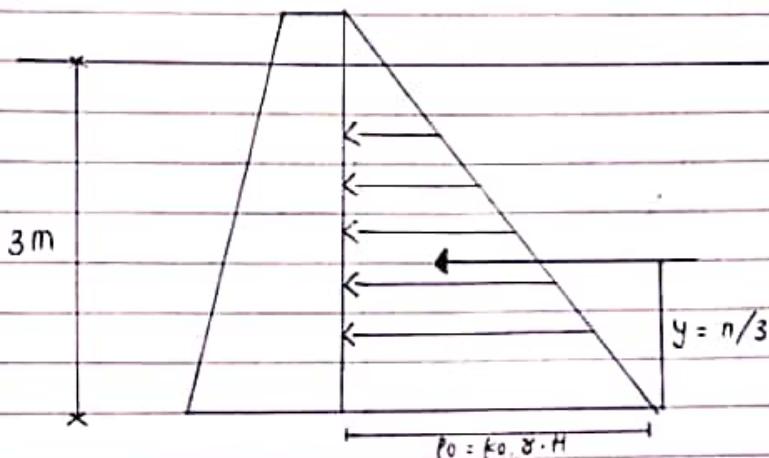
Condition \rightarrow at rest (pada saat diam)

Dit : a) Draw diagram of lateral pressure! (diagram tetesan lateral)

b) Calculate the magnitude and point of app. thrust the force on a wall. (titik tangkap gaya)

Jawab :

a)



* Calculate the k_0 . use this pattern :

$$k_0 = 1 - \sin \phi'$$

$$= 1 - \sin 25$$

$$= 0.577$$

Because, the soil in the cohesionless condition means "sand" (tanah non kohesif)

* And, find the value of p_0 which the pattern is :

$$p_0 = k_0 \cdot \gamma \cdot H$$

$$= 0.577 (18.4) (3)$$

$$= 31.85 \text{ KN}$$

b) Calculate the magnitude and point of app thrust the force (titik tangkap).

$$\Rightarrow y = H/3$$

$$= 3/3$$

= 1 m from the ground

3.2) Dik : Excavation was to be made on cohesive soil.

→ (tanah koheif)

$$\gamma b = 19.2 \text{ kN}$$

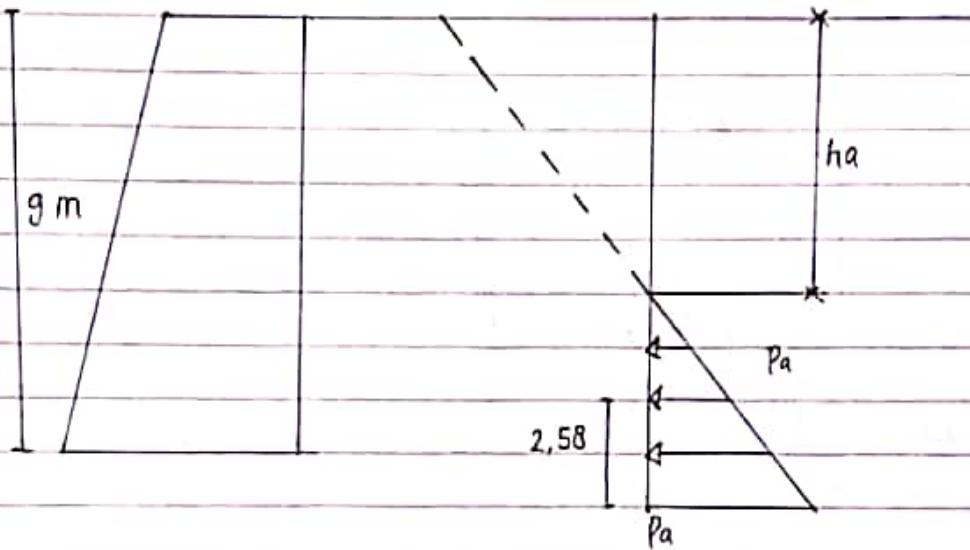
$$c' = 10 \text{ kPa}$$

$$\phi = 30^\circ$$

Dit : - Let the active pressure if the excavation was to be made up $H = 9 \text{ m}$.

- Calculate resulting force and point of opp?

Solution :



Find the k_a w/ Rankine's Theory :

$$k_a = \tan^2 \left(45^\circ - \frac{\phi}{2} \right)$$

$$= \tan^2 (40)$$

$$= 0.70$$

$$\sqrt{k_a} = \sqrt{0.70}$$

$$= 0.84$$

Reduction of active pressure due the effect of cohesion :

$$-2c\sqrt{k_a} = -2 \cdot 10 \cdot 0.84$$

$$= -16.8 \text{ kN/m}^2$$

Tekanan tanah aktif pada dasar dinding :

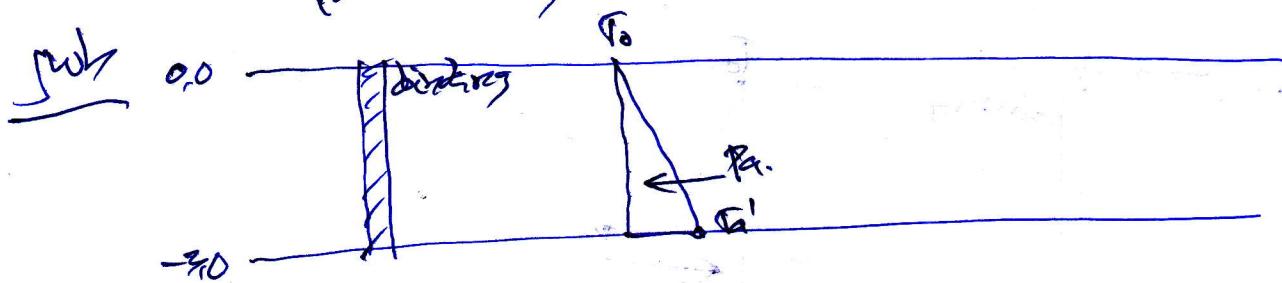
$$P_a = \gamma b \cdot H \cdot k_a - 2c\sqrt{k_a}$$

$$= 19.2 \cdot 9 \cdot 0.7 - 16.8$$

$$= 104.16 \text{ kN/m}^2$$

Tugas Soal. 3.1

- Dinding pd tanah tanpa kohesi, $\gamma_{sat} = 8,9 \text{ kN/m}^3$
 - sifat gesekan interakasi $c' = 0 \text{ kN}$
 - tinggi dinding = 3,0 m.
 - jika dinding sangat kaku, & ordinat tanah dialih
- a. Gbr. diagram tek. lateral di bawah dinding
- b. hitung besarnya & tipe perubahan G_f dorongan pd dinding.



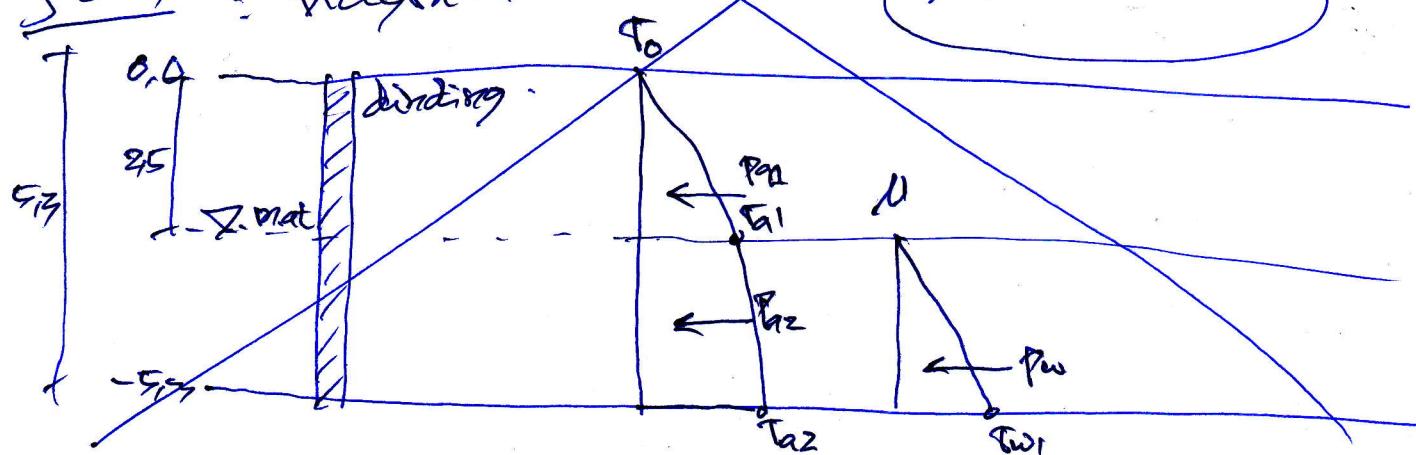
$$\begin{aligned}
 P_a &= \gamma \cdot S'_a \cdot H & S'_a &= 47,83 \cdot 1,0 \\
 &= 1/2 \cdot 10,23 \cdot 3 & & \\
 &= 15,35 \text{ kN/m}^2 & & \\
 & & & \left. \begin{aligned}
 k_a &= \tan^2(45 - \frac{\phi}{2}) \\
 &= 15 - \frac{25}{2} \\
 &= 0,906.
 \end{aligned} \right\}
 \end{aligned}$$

~~Soal. 3.2~~

- struktur pondasi tanah $T_{sat} = 15,3 \text{ kN/m}^2$.
- sifat tanah $c' = 0$, $\phi' = 30^\circ$, $\delta_f = 20,0 \text{ kN}$

a. hitung tek. lateral pd dinding jika mat 25° di bawah mutu tanah, sifat gesekan dinding $c' = 0$

sawah : diagram

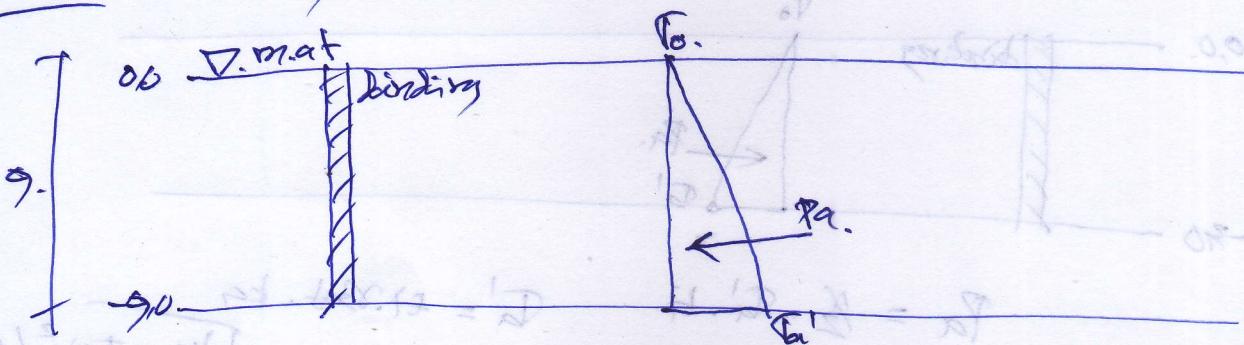


Sol. 3.2

- Galian pd tanah ke bawah $\theta = 19,2^\circ$
 $c' = 10 \text{ kPa} \quad \phi' = 10^\circ$

- a. triforay dalam galian \rightarrow tidak diambil.
 plot diagram teori retak jls dalam gali = 9m.
- b. triforay gali & titik stabilisasi \rightarrow diambil

Jawab : diagram



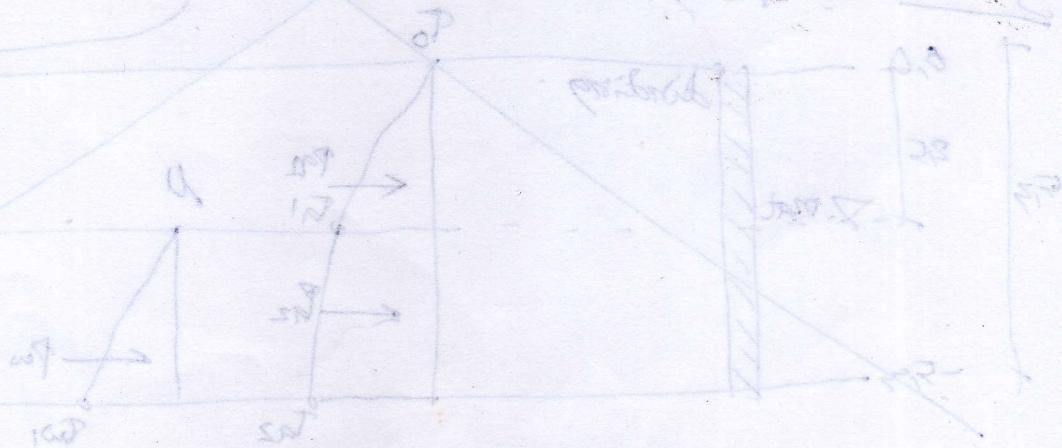
$$\begin{aligned} P_a &= \frac{1}{2} \cdot c' \cdot H \\ &= \frac{1}{2} \cdot 10 \cdot 9 \\ &= \end{aligned}$$

$$\begin{aligned} P_a' &= H \cdot \tan \phi' \\ &= 9 \cdot 19,2 \cdot 0,704 \\ &= 13,52 \text{ kN/m} \\ &= 45 - \frac{10}{2} \\ &= 0,704. \end{aligned}$$

INSI IT HARUS

masuk

harus

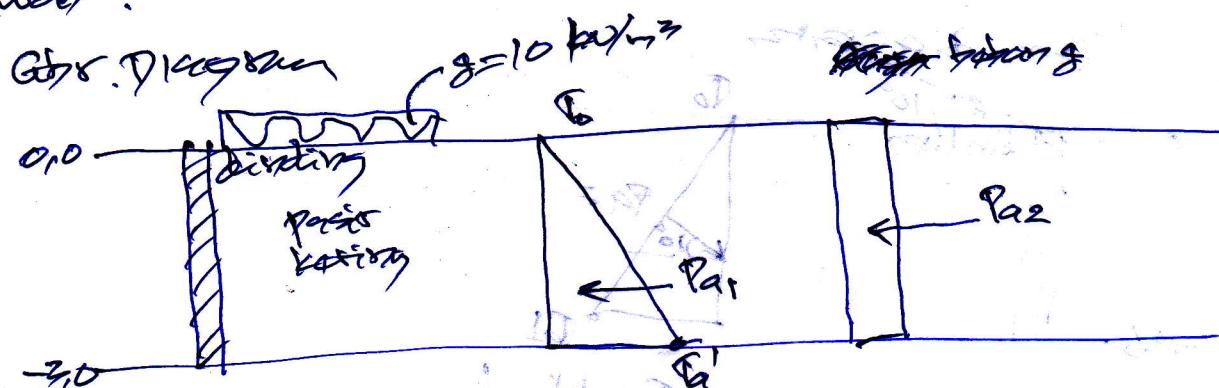


sud. 3.3

- Diringkai vertikal melalui posisi ketinggian $t = 3 \text{ m}$
 $\sigma_w = 18 \text{ kN/m}^2$, substitusikan $\phi' = 36^\circ$

Berapa Gaya dorong \rightarrow berakibat pada dinding jika
 berdasarkan persamaan $f = 10 \text{ kN/m}^2$ di perkenalkan
 ke dalam tanah, berakibatnya dinding kondisi aktif.

Jawab :



$$\begin{aligned} P_{a1} &= \frac{1}{2} \cdot \sigma'_1 \cdot t \\ &= \frac{1}{2} \cdot 7,02 \cdot 3 \\ &= 10,53 \text{ kN/m}^2 \end{aligned}$$

$$\begin{aligned} \sigma'_1 &= t \cdot \sigma_{sat} \cdot f_a \\ f_a &= \tan^2 15^\circ - \frac{\phi}{2} \\ &= \tan^2 15^\circ - \frac{36}{2} \\ &= 3 \cdot 18 \cdot 0,259 \\ &= 7,02 \text{ kN/m}^2 \end{aligned}$$

$$\begin{aligned} P_{a2} &= t \cdot g_0 \cdot f_a \\ &= 3 \cdot 10 \cdot 0,259 \\ &= 7,80 \text{ kN/m}^2 \end{aligned}$$

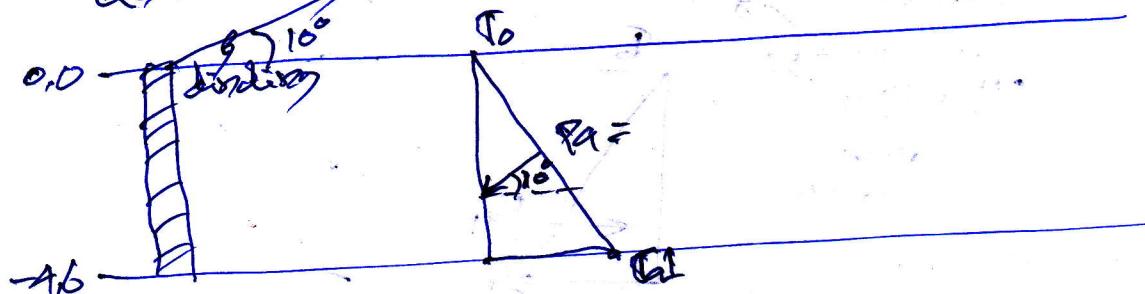
Soal. 2.4

- Diringi perlahan lurus ke baki
sifat sasis: $\delta = 20,9 \text{ kNm}^2$
- $\phi' = 35^\circ$
- $C' = 0^\circ$
- $\delta = 20^\circ$

Tambahkan gaya dorong aktif pada dinding tirossi 46°
jika perlahan berlari sudut 10° arah notisional

Jwb.

Gdr diagram



$$P_a = \frac{1}{2} \cdot \delta_{\text{as}} \cdot H$$

$$P_a = \frac{1}{2} \cdot 26,89 \cdot 4,6 \\ = 61,73 \text{ kNm}^2$$

$$\delta_{\text{as}} = H \cdot \delta_{\text{as}} \cdot k_{\text{as}} \\ = 4,6 \cdot 20,9 \cdot 0,286 \\ = 26,89 \text{ kNm}^2$$

$$k_{\text{as}} = \frac{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \phi}}{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \phi}}$$

$$\beta = \cos^{-1} 10^\circ = 0,985$$

$$\phi = \cos^{-1} 35^\circ = 0,819$$

$$= \frac{\cos^2 10^\circ - \sqrt{\cos^2 10^\circ - \cos^2 35}}{\cos 10^\circ - \sqrt{\cos^2 10^\circ - \cos^2 35}}$$

$$= \frac{0,985 - \sqrt{0,985^2 - 0,671}}{0,985 + \sqrt{0,985^2 - 0,671}}$$

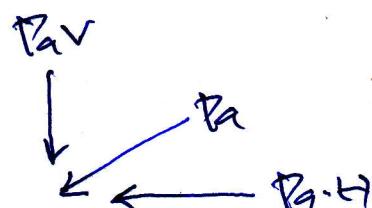
$$= \frac{0,439}{1,531} = 0,286$$

atau

$$P_a = \frac{1}{2} \cdot \delta_{\text{as}} \cdot H \cdot k_{\text{as}} \cos \beta \\ = \frac{1}{2} \cdot 26,89 \cdot 4,6^2 \cdot 0,286 \cdot \cos 10^\circ (0,985) \\ = 10,2 \cdot 4,6^2 \cdot 0,286 \cdot 0,985 \\ = 60,80 \text{ kNm}^2$$

$$P_{\text{att}} = P_a \cos 10^\circ \\ = 60,80 \cdot 0,985 \\ = 59,88 \text{ kNm}^2$$

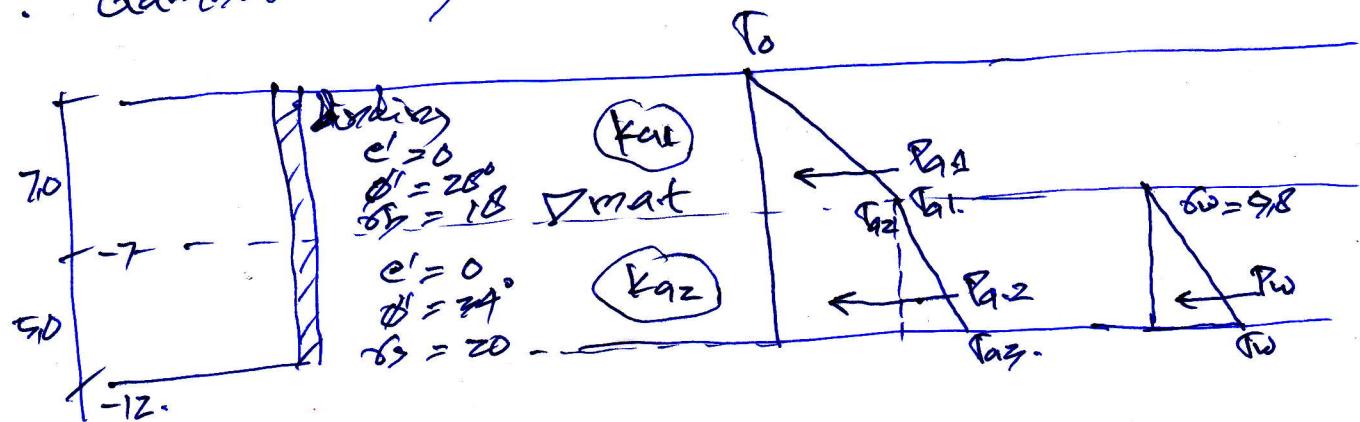
$$P_{\text{av}} = P_a \sin 10^\circ \\ = 60,80 \cdot 0,173 \\ = 10,557 \text{ kN}$$



Soal 3.5

- Dinding porosan tanah $T_{sat} = 12 \text{ M}$
- Masa tanah 2 lapisan dg sifat tanah pd Gbr
- a. konstruksi dibangun tanah aktif
- b. konstruksi tek. tiada di baliknya dinding

Jaw . Gambar diagram



$$\text{Rankine } P_{q1} = H_1 \cdot \gamma_b \cdot T_{ai} \Rightarrow T_{ai} = \frac{P_{q1}}{H_1 \cdot \gamma_b}$$

$$= 7.0 \cdot 18 \cdot 45,99 \\ = 129,20 \text{ kN/m}^3$$

$$T_{ai} = T_{sat}^2 (45 - \frac{\phi}{2}) \\ = 45 - \frac{24}{2} \\ = 0,361$$

$$P_{q2} = H_2 \cdot \gamma_b \cdot T_{ai} \cdot (F_{q1} + F_{q2})$$

$$T_{q2} = H_2 \cdot \gamma_b \cdot T_{ai}^2 \\ = 7.0 \cdot 18 \cdot 0,361^2 \\ = 35,66 \text{ kN/m}^3$$

$$T_{q2} = T_{sat}^2 \cdot 45 - \frac{\phi}{2} \\ = 45 - \frac{24}{2} \\ = 0,283.$$

$$= 7.0 \cdot 20 \cdot 0,283$$

$$T_{q3} = H_2 \cdot \gamma_b \cdot T_{ai} \cdot k_{q2} \Rightarrow F_{q2} \\ = 5.0 \cdot 20 \cdot 0,283 + 35,66 \\ = 63,96 \text{ kN/m}^3$$

$$= 7.0 \cdot 20 \cdot (35,66 + 63,96)$$

$$= 249,05 \text{ kN/m}^3$$

$$Pw = \sum F_2 \cdot F_w \quad F_w = H_2 \cdot \gamma_b = 5 \cdot 9,8 = 49,05$$

$$= 2 \cdot 5 \cdot 49,05$$

$$= 122,625 \text{ kN/m}^2$$

TUGAS. 4 Nofriandi fitti

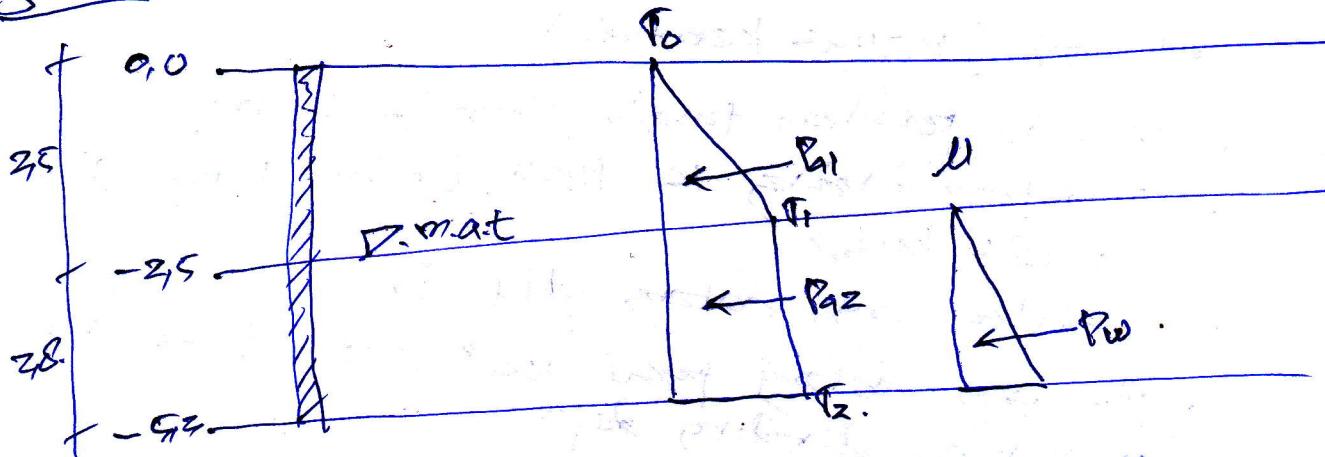
(4)

Soal contoh. 22. (ditulis kembali)

- struktur penahan gelas $T_{\text{gelas}} = 5,5 \text{ m}$
- sifat tanah di belakang dinding
 $\epsilon' = 0, \phi' = 30^\circ, \gamma_b = 20 \text{ kN/m}^3, \gamma_{\text{sat}} = 22, \gamma_w = 9.8$

a. Tentang distribusi tekanan lateral jika $D_{\text{mat}} = 2,5 \text{ m}$
 tanah permukaan tanah. asumsi bagian belakang dinding sedikit gesek $\epsilon' = 0$

Jwb : Gambar diagram.



Tekanan horizontal pada dinding

$$\Rightarrow P_a + P_w$$

Tek. Lateral $P_a = (\frac{1}{2} \cdot \gamma_b \cdot h_1) + (\gamma_1 \cdot \delta \gamma_2) + (\frac{1}{2} \cdot \gamma_2 \cdot h_2)$

$$\begin{aligned} \gamma_1 &= \gamma_b \cdot \gamma_b \cdot k_a \\ &= 25 \cdot 20,4 \cdot 0,333 \\ &= 17,0 \text{ kN/m}^2. \end{aligned} \quad \begin{aligned} k_a &= \tan^2(45 - \frac{\phi}{2}) \\ &= (45 - \frac{30}{2}) \\ &= 0,333. \end{aligned}$$

$$\begin{aligned} \gamma_2 &= \gamma_1 + (\gamma_{\text{sat}} - \gamma_w) \cdot \delta \gamma_2 \times k_a \\ &= 17,0 + (22 - 9,8) \cdot 2,8 \times 0,333 \\ &= 28,38 \text{ kN/m}^2. \end{aligned}$$

$$P_w = \gamma_w \cdot \delta \gamma_2 = (9,8 \cdot 2,8) = 27,15$$

$$P_a = (\frac{1}{2} \cdot 17,0 \cdot 2,5) + (17,0 \cdot 2,8) + (\frac{1}{2} \cdot 28,38 \cdot 2,5)$$

$$= 21,25 \rightarrow 47,6 + 15,93.$$

$$= 84,78 \text{ kN}$$

(2)

Tab. air pasi

$$P_w = \gamma_z \cdot \tau_w \cdot H_z$$

$$= 12 \cdot 2745 \cdot 2,5$$

$$= 38,43 \text{ kN}$$

Tekanan dari sisi depan dinding

$$= P_a + P_w$$

$$= 84,72 \text{ kN} + 38,43 \text{ kN}$$

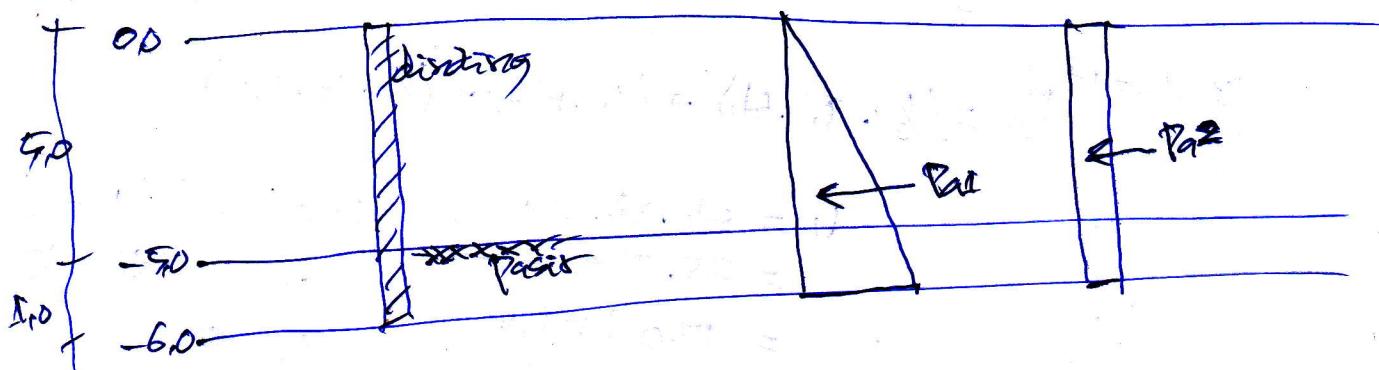
$$= 123,12 \text{ kN}$$

Cari gaga di depan (ditulis kombinasi)

- struktur penahan tanah tinggi = 6,0 m

- xi depan dinding lci pada tinggi + m, rd pasir
= 18,5 kN/m²a. Tantukan gaga depan akibat P_a b. Jika gaga depan pasif 100% akibat pasir + xi
xi menahan dinding depan.Jawab:

- Ganda diagram

Gaga pasif akibat / P_a

$$P_a = (\gamma_z \cdot \Delta^1) \times (H - \tau a^2) \times b$$

$$= (12 \cdot 48,72) \times (6 - 12,71) \times 6$$

$$= 146,16 - 76,72$$

$$= 69,72 \text{ kN/m}^2$$

$$\Delta^1 = \gamma_z \cdot b \cdot k_a$$

$$= 12 \cdot 6,0 \cdot 48,72 \quad \left[k_a = \tan^2(45 - \frac{\phi}{2}) \right]$$

$$= 48,72 \text{ kN/m}^2$$

$$= 0,466$$

$$\Delta^2 = -2 \cdot C' \cdot k_a$$

$$= -2 \cdot 10 \times 0,466$$

$$= -12,72 \text{ kN/m}^2$$

Gass färs perf / P_w

(3)

$$= P_p = \gamma_2 \cdot T_p \cdot H_z \quad T_p = 28 \cdot 10^{-3} \cdot T_p$$

$$= 1,45,51,11$$

$$= 27,76 \text{ kN/m}^3$$

$$K_p = \frac{1}{KA} = \frac{1}{0,906}$$

$$= 18,5 \cdot 1,246 = 246$$

$$= 18,51 \text{ kN/m}^3$$

$P_a > P_p \rightarrow$ Press färdet med monterat gaskon därför

Nama : Shafiq Adynata.

NPM : 182710038

Matkul : Rekayasa Geoteknik lanjut (Tugas 4)

3.1/ Dik : $\gamma = 18,4 \text{ kN/m}^3$

$$\phi = 25^\circ$$

Cohesionless soil \rightarrow Tanah non koheif

$$H = 3 \text{ m}$$

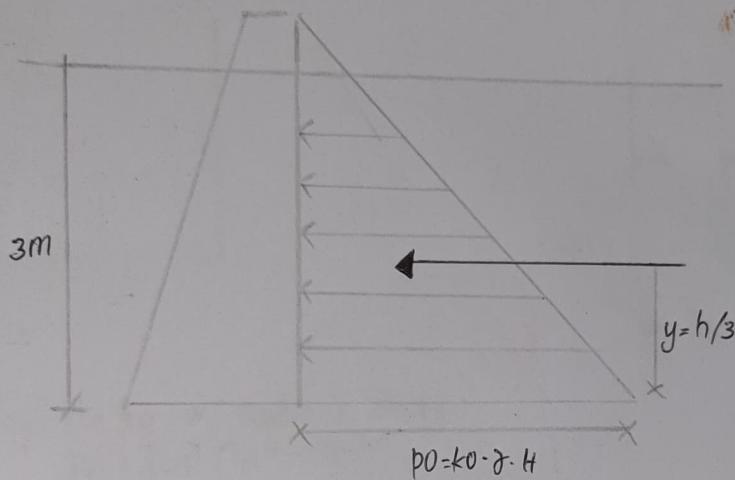
Condition \rightarrow at rest (Pada saat diam)

Dit : a.) Draw diagram of lateral pressure! (Diagram bekanan lateral).

b.) Calculate the magnitude and point of app. thrust the force on a wall (Titik tangkap gaya).

Jawab:

a.)



* Calculate the k_0 , use this pattern :

$$k_0 = 1 - \sin \phi$$

$$= 1 - \sin 25$$

$$= 0,577$$

Because, the soil in the cohesionless condition it means "Sand" / tanah non koheif

* And, find the value of p_0 which the pattern is :

$$\begin{aligned} p_0 &= k_0 \cdot \gamma \cdot H \\ &= 0,577 \cdot (18,4) \cdot (3) \\ &= 31,85 \text{ KN} \end{aligned}$$

b.) Calculate the magnitude and point of app. thrust the force (Titik tangkap)

$$y = H/3$$

$$= 3/3 = 1 \text{ m from the ground}$$

→ Tanah koheif.

3.2 / Dik: Excavation was to be made on Cohesive soil

$$\gamma_b = 19,2 \text{ kN}$$

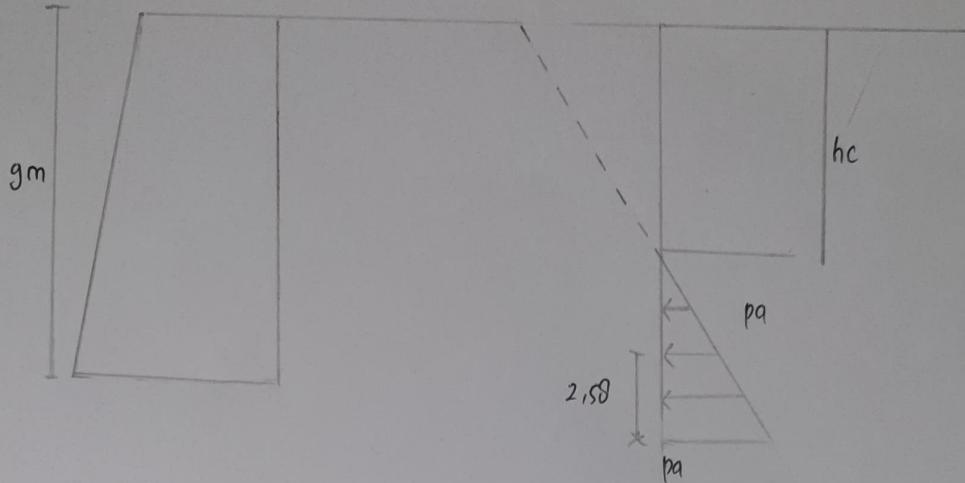
$$c' = 10 \text{ kPa}$$

$$\phi = 10^\circ$$

Dit: - Plot the active pressure if the excavation was to be made up $H = gm$.

- Calculate resulting force and point of app?

Solution:



Find the k_a w/ Rankine's theory:

$$k_a = \tan^2(45^\circ - \frac{\phi}{2})$$

$$= \tan^2(40)$$

$$= 0,70 //$$

$$\sqrt{k_a} = \sqrt{0,70}$$

$$= 0,84 //$$

Reduction of active pressure due the effect of cohesion:

$$-2c\sqrt{k_a} = -2 \cdot 10 \cdot 0,84$$

$$= -16,8 \text{ kN/m}^2 //$$

Tekanan tanah aktif pada dasar dinding:

$$p_a = \gamma_b \cdot H \cdot k_a$$

$$= 19,2 \cdot 9 \cdot 0,7 - 16,8$$

$$= 104,16 \text{ kN/m}^2 //$$

Kedalaman Retakan:

$$h_c = \frac{2c}{\gamma_b \cdot \sqrt{k_a}} = \frac{2(10)}{19,2 \cdot 0,84}$$

$$= 1,24 \text{ m}$$

Tekanan tanah aktif total :

$$P_a = \frac{1}{2} \cdot (104,16) \cdot (g - 1,24)$$
$$= 404,14 \text{ kN/m}$$

$$\text{Titik tangkap} = (g - 1,24) / 3$$
$$= 2,88 \text{ dari dasar dinding}$$

Tugas Kuliah 4

Contoh Masalah 3,2

struktur penahan adalah mendukung penggalian tinggi 5,3 m. Dinding ini telah bergerak cukup untuk mengembangkan kondisi aktif. Sifat tanah di belakang penahan dinding adalah $c' = 0$; $\phi' = 30^\circ$; $b = 20,4 \text{ kN/m}^3$, $(\text{Sat}) = 22,0 \text{ kN/m}^3$. Menghitung distribusi tekanan lateral yang bekerja pada dinding ini jika meja air tanah ada di 2,5 m di bawah permukaan tanah. Asumsikan bahwa bagian belakang dinding halus sehingga sudut gesekan dinding $(\gamma) = 0$.

Solusi

gunakan teori Rankine $KA = \tan^2(45 - \phi'/2) = 0,333$ gambar P 3.2 a. tekanan bumi lateral (Lihat diagram) $PA = 1/2 \times 17 \times 2,5 + 17 \times 2,8 + 1/2 \times 11,38 \times 2,8$ $PA = 21,25 + 47,6 + 15,93$ $PA = 84,78 \text{ kN}$ b. tekanan hidrostatik (Lihat diagram) $20,4 \times 2,5 \times 0,333 = 17,17$ $17 + (22-9,8) 2,8 \times 0,333 = 28,38$ $9,8 \times 2,8 = 27,45$ pasir, $(\phi' = 30^\circ)$ $c' = 0$ ($b = 20,4 \text{ kN/m}^3$) $(\text{SAR}) = 22 \text{ kN/m}^3$ $2,5 \text{ m}$ $2,8 \text{ m}$ $PW = 1/2 \times 27,45 \times 2,8$ $PW = 38,43 \text{ KN}$

Total tekanan horisontal di dinding = $PA + PW = 84,78 + 38,43 = 123,2 \text{ kN}$ contoh masalah 3,4 sebuah struktur penahan adalah mendukung penggalian tinggi 6 m seperti yang ditunjukkan pada gambar P 3.4. Dinding bergerak cukup yang berlaku kondisi aktif di belakang dinding. Isi pasir kering setinggi 1 m ditempatkan di depan dinding untuk mengurangi gerakan. Satuan berat kering isi pasir adalah $18,5 \text{ kN/m}^3$. (a) menentukan kekuatan dorong aktif PA bekerja di dinding, dan (b) menentukan gaya pasif yang disebabkan oleh pasir mengisi di depan dinding, (c) jika dorong pasif yang 100% dimobilisasi, adalah 1 m pasir mengisi cukup untuk mempertahankan gerakan dinding (menggunakan gaya keseimbangan horisontal). Solusi gunakan teori Rankine $KA = \tan^2(45 - \phi') = 0,406$ $KP = KA 1 = 2,46$ gambar P 3.4 a.

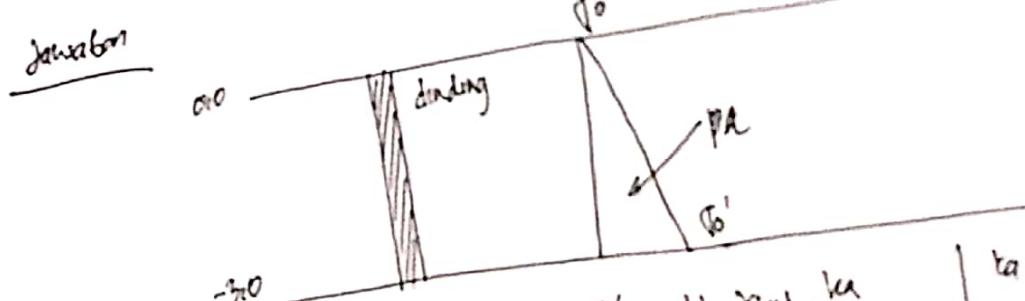
Kekuatan aktif (Lihat diagram) isi PP pasir, $(\phi' = 25^\circ)$ ($b = 18,5 \text{ kN/m}^3$) $(\phi' p = 18,5 \times 1 \times 2,46 = 45,51$ $(\phi' a = 20 \times 6 \times 0,406 = 48,72)$ 5 m 1 m $-2 \times 10 \times \sqrt{0,406} = -12,74$ ($b = 20 \text{ kN/m}^3$) $c' = 10 \text{ kPa}$ $(\phi' = 25^\circ)$ $Pa_1 = Pa_2 = 1/2 \times 48,72 \times 6 - 12,74 \times 6 = 146,16 - 76,44 = 69,72 \text{ kN}$ b. kekuatan pasif (Lihat diagram) $PP = 1/2 \times 45,51 \times 1 = 27,76 \text{ kN}$ $PA > PP \rightarrow$ isi pasir tidak cukup untuk menahan gerakan dinding

TUGAS 4

Nama: Achli Sariawan
Nim: 18271 00 96.

Tugas Soal 3D

- Dinding pada jarak tanpa kohesi, $\gamma_{sat} = 84 \text{ kn/m}^3$
 - Sudut gesek internal $\phi' = 25^\circ$
 - Tinggi dinding = 30 m
 - jika dinding sebagai katrol berada di ujung
- a). Gambarkan diagram TK. laterial di bawah dinding
- b) Hitung besarnya dan titik penampang beban dinding pada ujung



$$P_A = J_0 \cdot J_0' \cdot \gamma$$
$$= 1/2 \cdot 10 \cdot 25 \cdot 3$$
$$= 157,5 \text{ kn/m}^2$$

$$J_0' = H \cdot \gamma_{sat} \cdot k_a$$
$$= 3 \cdot 84 \cdot 0,4064$$
$$= 10.23 \text{ kn/m}^2$$

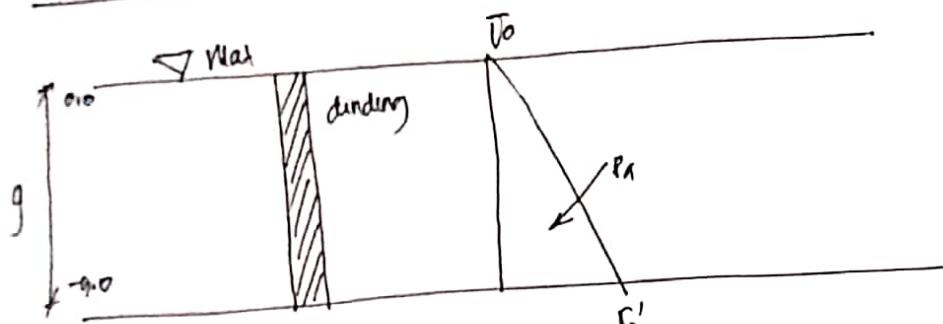
$$\begin{aligned} k_a &= \pi r^2 \\ &= (45 - \frac{\pi}{2}) \\ &= 45 \cdot \frac{\pi}{2} \\ &= 61906 \end{aligned}$$

Soal 3.2

- tekan pada tanah koefis = $\gamma_b = 19,12 \text{ kN/m}^3$
 $c' = 10 \text{ kPa}, \phi' = 10^\circ$

- Hitung tekanan tanah yg tidak didukung plat
 diagram tekanan tpt, jika jarak talenan = 9 m
- Hitung gaya dorong dan titik aplikasinya yg dihasilkan

Jawaban



$$\begin{aligned} P_A &= \frac{1}{2} T_0 \cdot H \\ &= 11,2 \cdot 13,52 \cdot g \\ &= 60,89 \end{aligned}$$

$$\begin{aligned} P_A' &= H \cdot f_{sat} \cdot k_a \\ &= g \cdot 19,12 \cdot 0,709 \\ &= 13,52 \text{ kN/m}^2 \end{aligned}$$

$$\left. \begin{aligned} k_a &= \tan^2(45 - \frac{\phi'}{2}) \\ &= 9,5 - \frac{10}{2} \\ &= 6,709 \end{aligned} \right\}$$

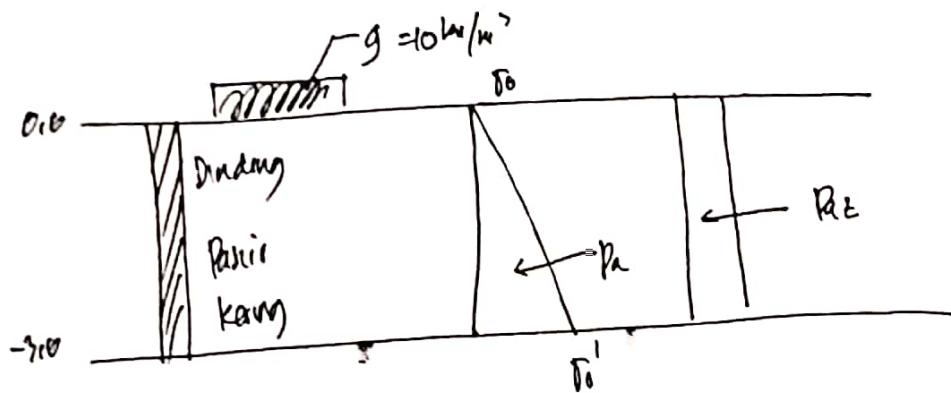
Soal 3.3

- Dinding vertikal memotong pasir learing $t = 3 \text{ m}$
 $\gamma_w = 18 \text{ kn/m}^3$. Sudut gesek $\phi = 36^\circ$

berapa beara dorong yang berakasi pada dinding jika
 letak tambahan $g = 10 \text{ kn/m}^3$ di permukaan tanah,
 selakang dinding kondisi aktif.

Jawab

Gambar Diagram



$$\begin{aligned} P_{a1} &= \frac{1}{2} \gamma_a \cdot H \\ &= \frac{1}{2} \cdot 18 \cdot 2 \cdot 3 \\ &= 54 \text{ kn/m}^3 \end{aligned}$$

$$\begin{aligned} T_a' &= H \cdot f_{sk} \cdot k_a \rightarrow k_a = \tan 45 - \frac{\phi}{2} \\ &= 3 \cdot 18 \cdot 0.259 \\ &= 7.02 \text{ kn/m}^3 \end{aligned}$$

$$\begin{aligned} &= \tan^2 45 - \frac{36}{2} \\ &= 0.259 \end{aligned}$$

$$\begin{aligned} P_{a2} &= H_1 \cdot g_w \cdot k_a \\ &= 3 \cdot 10 \cdot 0.259 \\ &= 7.80 \text{ kn/m}^3 \end{aligned}$$

Soal 3.4

Dinding penahan tanah terpaku kokoh
Sifat tanah : $f = 20,4 \text{ kn/m}^2$

$$\phi' = 35^\circ$$

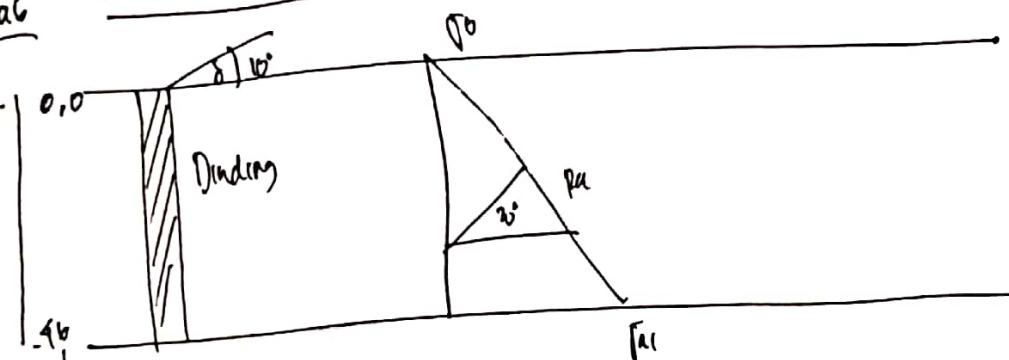
$$C' = 0$$

$$\gamma = 20^\circ$$

Tanah berada dalam posisi setengah pada dinding dengan jarak 4,6 m jika tembunan berbeza arah 10° arah horizontal.

Tambang Diagram :

Jawab



$$\begin{aligned} P_w &= \frac{1}{2} \cdot F_a \cdot H \\ &= 1/2 \cdot 26,84 \cdot 4,6 \\ &= 61,73 \text{ kn/m}^2 \end{aligned}$$

arau :

$$\begin{aligned} P_a &= 1/2 \cdot 26,84 \cdot H^2 \cdot \cos \beta \\ &= 1/2 \cdot 20,4 \cdot 4,6^2 \cdot 0,286 \cdot \cos 10^\circ (0,985) \\ &= 10,2 \cdot 4,6^2 \cdot 0,286 \cdot 0,985 \\ &= 60,80 \text{ kn/m}^2 \end{aligned}$$

$$\begin{aligned} P_a H &= P_a \cos 10^\circ \\ &= 60,80 \cdot 0,985 \\ &= 59,88 \text{ kn/m}^3 \end{aligned}$$

$$\begin{aligned} P_{av} &= P_a \sin 10^\circ \\ &= 60 \cdot 80 \cdot 0,173 \\ &= 10,357 \text{ kn} \end{aligned}$$

Pav

Pa

PaH

$$\begin{aligned} T_{ad} &= H \cdot f_{sat} \cdot k_a \\ &= 4,6 \cdot 20,4 \cdot 0,286 \\ &= 26,84 \text{ kn/m}^2 \end{aligned}$$

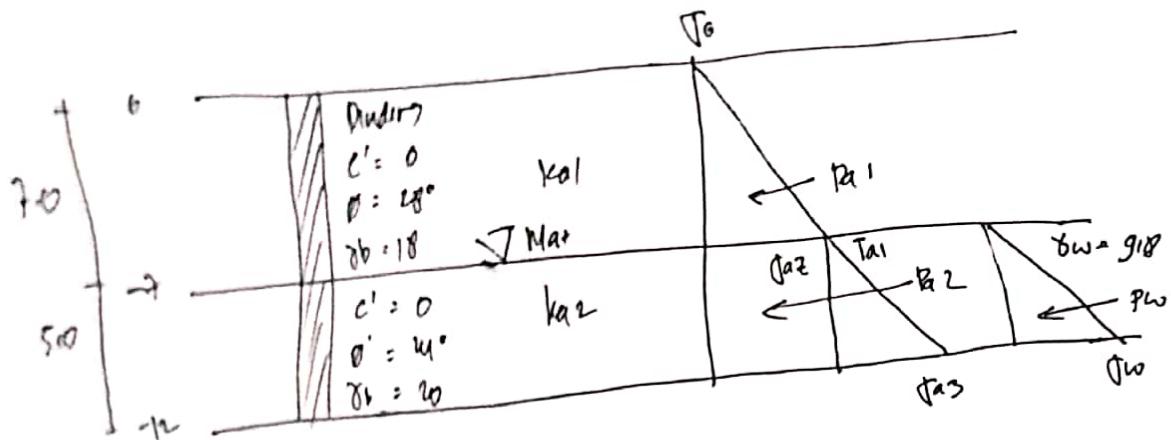
$$\begin{aligned} k_a &= \frac{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \phi}}{\cos \phi + \sqrt{\cos^2 \beta \cdot \cos^2 \phi}} \\ \beta &= \cos^{-1} 10^\circ = 0,985 \\ \phi &\cos 35^\circ = 0,819 \\ &= \cos^{-1} 10^\circ \cdot \sqrt{\cos^2 10^\circ - \cos^2 35^\circ} \\ &= \frac{0,985 - \sqrt{0,970 - 0,671}}{0,985 + \sqrt{0,970 - 0,671}} \\ &= \frac{0,434}{1,531} = 0,286 \end{aligned}$$

Solusi 3.5

- Dinding perbatasan tanah tinggi = 12m
- Massa tanah 2 lapis dengan sifat tanah pada batas
- a). tanah potongan tanah aktif
- b) tanah aktif teknik hidrolik di belakang dinding

Jawab

Gambar diagram :



Penghitung

$$p_{a1} = H \cdot \gamma_b \cdot k_{a1}$$

$$= 7,0 \cdot 18 \cdot 0,45 \cdot 0,40$$

$$= 159,20 \text{ kn/m}^2$$

$$k_{a1} = T_a b^c (45 - \frac{\phi'}{2})$$

$$= 0,136$$

$$T_{a1} = H \cdot \gamma_b \cdot k_{a1}$$

$$p_{a2} = H_2 \cdot \gamma_b \cdot (k_{a1}' + k_{a2}) = 7,0 \cdot 18 \cdot 0,1361$$

$$k_{a2} = H_1 \cdot \gamma_b \cdot k_{a2}$$

$$= 7,0 \cdot 18 \cdot 0,1283$$

$$= 35,66 \text{ kn/m}^2$$

$$T_{a2} = A_s \cdot q_s \text{ kn/m}^2$$

$$k_{a2} = T_{a2}^2 \cdot \frac{45 - \phi'}{45 - \frac{3\phi}{2}}$$

$$= 0,183$$

$$T_{a3} = H_2 \cdot \gamma_{sat} + k_{a2} + T_{a2}$$

$$= 7,0 \cdot 20 \cdot 0,1283 + 35,66$$

$$= 63,96$$

$$= 7,0 \cdot 20 \cdot (35,66 + 63,96)$$

$$= 249,05 \text{ kn/m}^2$$

$$p_w = H_2 \cdot H_2 \cdot \gamma_w$$

$$= 12 \cdot 5 \cdot 9,81 = 59,05 \text{ kn/m}^2$$

$$= 122,625 \text{ kn/m}^2$$

$$\gamma_w = H_2 \cdot \gamma_w = 5,98 = 49,05 \text{ kn/m}^2$$

TUGAS A (ADHII SATRIAWAN)

NIM 182710096

Soal. contoh 3.2 (dilanjutkan)

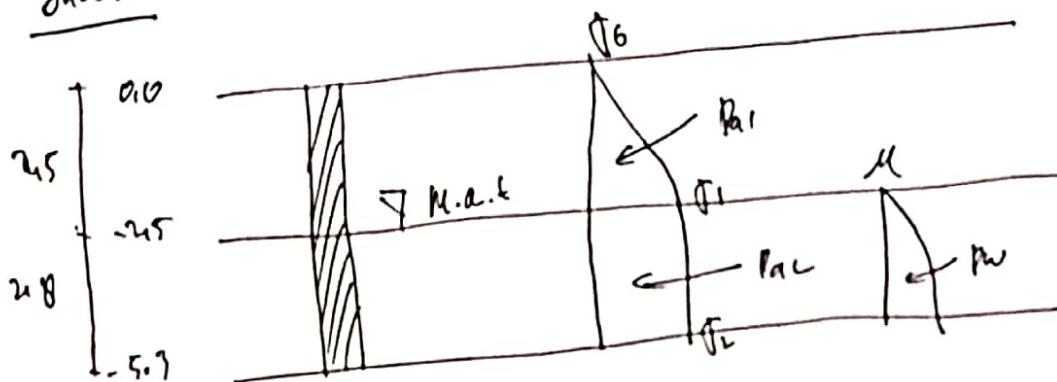
- Struktur penahan tanah. Galan tinggi = 5,5 m

- Sifat tanah dan di belakang dinding

$$\gamma' = 0, \phi' = 30^\circ, \gamma_b = 20.19, f_{sw} = 22, \gamma_w = 9.8$$

a) Hitung Distribusi tekanan lateral jika tanah lurus lurus
berikan per sebalahan tanah, asumsi bagian belakang
dinding sudut genarle $\theta' = 0$

Jawab : Gambar Diagram



tekanan horizontal pada dinding

$$\Rightarrow Pa + Pw$$

$$\text{tekn. lateral } Pa = (\frac{1}{2} \cdot \gamma_b \cdot H_1) + (\gamma_1 \cdot H_2) + (\frac{1}{2} \gamma_2 \cdot H_2)$$

$$\begin{aligned} \gamma_1 &= \gamma_b \cdot \gamma_a \\ &= 20.19 \cdot 0.333 \\ &= 17.0 \text{ kN/m}^3 \end{aligned}$$

$$\begin{aligned} \gamma_2 &= \tan^2 (45 - \frac{\phi'}{2}) \\ &= (45 - 15) \\ &= 0.333 \end{aligned}$$

$$\begin{aligned} \gamma_2 &= \gamma_1 + (\gamma_{sat} - \gamma_w) \cdot H_2 \times k_a \\ &= 17.0 + (22 - 9.8) \cdot 2.8 \times 0.333 \\ &= 28.38 \text{ kN/m}^3 \end{aligned}$$

$$f_w = \gamma_w \cdot H_L = (9.8 \cdot 2.5) = 24.5$$

$$\begin{aligned} Pa &= (\frac{1}{2} \cdot 17.0 \cdot 4.5) + (17.0 \cdot 2.8) + (\frac{1}{2} \cdot 28.38 \cdot 2.5) \\ &= 21.25 + 47.6 + 15.93 \\ &= 84.78 \text{ kN/m} \end{aligned}$$

Tek. air Porti

$$\begin{aligned} P_w &= \frac{1}{2} \cdot \gamma_w \cdot H_2 \\ &= \frac{1}{2} \cdot 27.95 \cdot 2.5 \\ &= 38.93 \text{ kN} \end{aligned}$$

Tekanan Horizontal Dinding

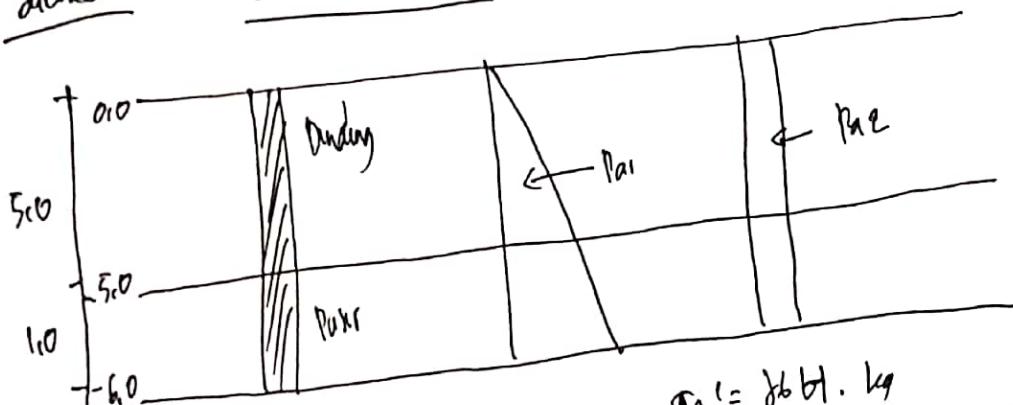
$$\begin{aligned} &= P_a + P_w \\ &= 89.70 \text{ kN} + 38.93 \text{ kN} \\ &= 128.63 \text{ kN} \end{aligned}$$

Ceritah Soal 3.9 (Pintu Kembali)

- Struktur penahan tanah tinggi = 6 m
- Di depan dinding hr. Pintu tinggi 1 m, jd. $\gamma_{air} = 10.5 \text{ kN/m}^3$

- a) tentukan gaya d. Aktif P_a .
 b) jika gaya dorong part 100% adalah pintu 1 m
 untuk menahan dinding depan

Jawab - Gambar Diagram :



$$\begin{aligned} P_a &= \gamma_b b t \cdot k_a \\ &= 20 \times 6 \times 0.906 \\ &= 108.72 \quad \left| \begin{array}{l} k_a = \gamma_m^3 - \left(\frac{\gamma_s - \gamma}{2} \right) \\ = (0.906) \end{array} \right. \end{aligned}$$

Gaya Tanah Aktif / P_a

$$\begin{aligned} P_a &= \left(\frac{1}{2} \cdot \gamma_a \right) \times (H - \gamma_a') \times b \\ &= \left(\frac{1}{2} \cdot 10.5 \right) \times (6 - 10.5) \times 6 \\ &= 146.6 - 76.72 \\ &= 69.72 \text{ kN/m} \end{aligned}$$

$$\begin{aligned} \gamma_a' &= -2 \cdot e \sqrt{\gamma_m} \\ &= -2 \cdot 10 \sqrt{0.906} \\ &= 12.174 \end{aligned}$$

Gaya tanah Pintu / P_p

$$\begin{aligned} \Rightarrow P_p &= \frac{1}{2} \cdot \gamma_p \cdot H_2 \\ &= \frac{1}{2} \cdot 9.5 \cdot 5.1 \cdot 1 \\ &= 24.76 \text{ kN/m} \end{aligned}$$

$$\begin{aligned} P_p' &= \gamma_b \cdot H_p \cdot k_p \rightarrow k_p = \frac{1}{\gamma_a} = \frac{1}{0.906} \\ &= 10.5 \cdot 1 \cdot 2.16 \\ &= 24.6 \text{ kN/m} \end{aligned}$$

* $P_a > P_p \rightarrow$ Pintu tidak kuat menahan tanah dinding

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Tugas . 4

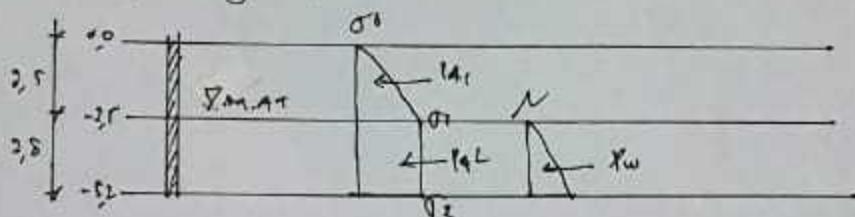
Soal contoh 3.2

- Struktur penahan gelan tinggi = 5,3 m
- Sifat tanah dibekting diiring
 $c' = 0$, $\phi' = 30^\circ$, $\delta_3 = 204$, $\gamma_{sat} = 22$, $\gamma_w = 9,8$

a). Hitung distribusi tekanan lembut pada tanah
pada permukaan tanah, misalnya bagian belakang
dinding

$$c' = 0$$

Gambar diagram



Tekanan Horizontal pd dinding
 $\Rightarrow P_n + P_w$

Tekanan Lembut

$$P_n = (\gamma_1 \cdot \delta_1 \cdot H_1) + (\gamma_1 \cdot H_2) + (\gamma_2 \cdot \delta_2 \cdot H_2)$$

$$\begin{aligned}\delta_1 &= H_1 \cdot \gamma_2 \cdot k_a \\&= 2,5 \cdot 20,4 \cdot 0,333 \\&= 17,0 \text{ kN/m}^2\end{aligned}\quad \begin{aligned}k_a &= \tan^2(45 - \frac{\phi'}{2}) \\&= (45 - \frac{30}{2}) \\&= 0,333\end{aligned}$$

$$\begin{aligned}\delta_2 &= \gamma_1 \cdot (\delta_{nl} - \gamma_w) \cdot H_2 \cdot k_a \\&= 17,0 (22 - 9,8) \cdot 2,8 \cdot 0,333 \\&= 20,58 \text{ kN/m}^2\end{aligned}$$

$$\gamma_w = \gamma_w \cdot H_2 = (9,8 \cdot 2,8) = 27,45$$

$$\begin{aligned}P_n &= (\gamma_1 \cdot 17,0 \cdot 2,5) + (17,0 \cdot 2,8) + (\gamma_2 \cdot 20,58 \cdot 2,5) \\&= 21,25 + 47,6 + 15,92 \\&= 84,78 \text{ kN}\end{aligned}$$

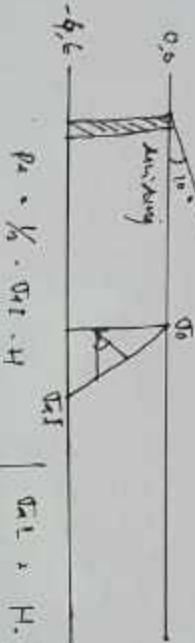
Soal 3.4

- Diketahui kendaraan tumpang ke kereta api
kecepatan $v_k = 20,4 \text{ km}/\text{m}^2$

$$\begin{aligned}\theta' &= 25^\circ \\ C' &= 0 \\ \delta &= 30^\circ\end{aligned}$$

Tentukan jarak dorong selisih pada arah yang berlawanan
dengan pergerakan kereta api sejauh 10' setiap horizont

Carikan diagram



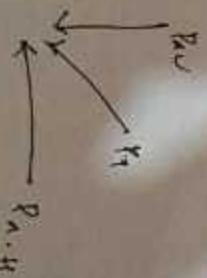
atau

$$\begin{aligned}R_k &= R_k \cos \theta' + R_k \sin \theta' \\ R_k &= R_k \cdot 0,914 + R_k \cdot 0,414 \\ R_k &= 25,34 \cdot 0,914 \\ &+ 25,34 \cdot 0,414 \\ &= 61,23 \text{ km}/\text{m}^2\end{aligned}$$

atau

$$\begin{aligned}R_k &= R_k \cos \theta' - R_k \sin \theta' \\ R_k &= R_k \cdot 0,914 - R_k \cdot 0,414 \\ R_k &= 25,34 \cdot 0,914 \\ &- 25,34 \cdot 0,414 \\ &= 60,80 \text{ km}/\text{m}^2\end{aligned}$$

$$\begin{aligned}R_k &= R_k \cos \theta' + R_k \sin \theta' \\ R_k &= R_k \cdot 0,914 + R_k \cdot 0,414 \\ R_k &= 60,80 + 0,414 \\ &= 60,80 + 0,914 \\ &= 59,88 \text{ km}/\text{m}^2\end{aligned}$$



$$\begin{aligned}R_k &= R_k \cos \theta' + R_k \sin \theta' \\ &= 60,80 \cdot 0,914 \\ &+ 60,80 \cdot 0,414\end{aligned}$$

Tek. air pan

$$P_w = \frac{1}{2} \cdot \sigma_w \cdot H^2$$

$$= \frac{1}{2} \cdot 24,45 \cdot 2,5$$

$$= 30,49 \text{ kN}$$

stekan horizontal dimung

$$= P_h + P_w$$

$$= 84,78 \text{ kN} + 30,49 \text{ kN}$$

$$= 125,2 \text{ kN}$$

center load 3/4 (diketahui kapas)

- strukturnya berikan angka tinggi = 6,0 m
- diketahui dimung di perekat tinggi 1 m, & d. per
- = 18,5 kN/m^2

a. tutukan gaya tetap aktif P_h

b. Gaya paya tetap pada posisi Z, yakni posisi tan
/ menahan dimung agar

stek

- Gambar Diagram



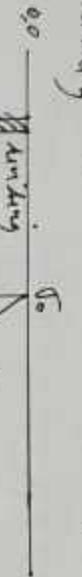
$$\begin{aligned}P_h &= (\frac{1}{4} \cdot \sigma_4) \cdot (H - \sigma_4)^2 \times 6 \\&= (\frac{1}{4} \cdot 48,72) \times (6 - 48,72) \times \\&= 196,16 - 74,72 \\&= 69,32 \text{ kN/m}^2\end{aligned}$$

$$\begin{aligned}\text{Gaya tahan } \sigma_{44} / P_w &\quad \sigma'_4 = \sigma_4 \cdot H \cdot k_p \\&= P_h \cdot \frac{1}{2} \cdot \sigma'_4 \cdot H \quad * \quad \sigma_4 \cdot \frac{1}{k_w} = \frac{1}{0,906} \\&= \frac{1}{2} \cdot 45,51 \cdot \frac{1}{2} \\&= 27,46 \text{ kN/m}^2 \\&= 18,5 \cdot \frac{1}{2} \cdot 2,46 \\&= 45,51 \text{ kN/m}^2\end{aligned}$$

$P_h > P_h \rightarrow$ posisi tidak kuat menahan perekat dimung

Soal 2.1

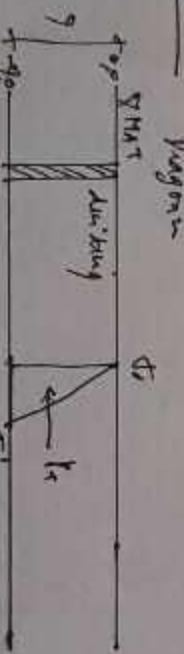
- Dinding pada tanah bergradien, $\delta_{tan} = 0,9$ km
- Sosok gerak internal cft : $\phi = 25^\circ$
- Tinggi dinding = 20 m
- Diketahui dinding sangat lebar, berada pada tanah
- a. Gunakan betul-betul di belakang dinding
- b. Hitung besar nya di bawah permasalahan setiap segitiga tersebut



Soal 3.2

$$k_a = k_s \cdot \delta_a \cdot H \\ \delta_a = 10 \text{ m}, H = 10^\circ$$

- a. Hitung ketebalan gelan yang tidak terikat
Metode gerak tektonik eff gelaan dalam gelan = 9 m
b. Hitung gaya tekan teknik apabila yg dimulihkan
dengan pengaruh



$$P_a = \frac{1}{2} \cdot \delta_a' \cdot H \\ = \frac{1}{2} \cdot 10,52 \cdot 10 \\ = 60,34 \text{ kN/m}^2 \\ = 0,704$$

$$\delta_a' = H \cdot \tan \cdot k_a \\ = 10 \cdot 10^\circ \cdot 0,704 \\ = 10,52 \text{ m/m} \\ = 45 - \frac{10}{2}$$

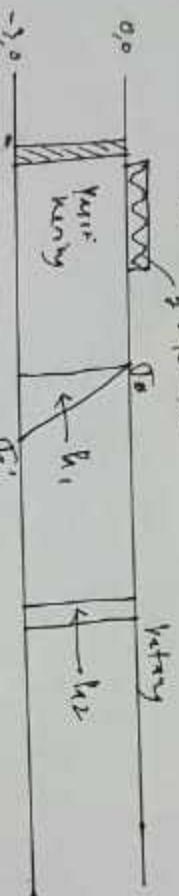
$$k_a = \tan^2 (45 - \frac{\phi}{2})$$

Soal 9.3

- Dimana vertikal menahan pasir kerang $t = 2\text{ m}$
- $\gamma_w = 18 \text{ kN/m}^3$, sudut gesek $\phi = 30^\circ$
- Pasir pasir dengan $\gamma = 16 \text{ kN/m}^3$ dipertimbangkan tanah,
- ukuran tanah $g = 10 \text{ kN/m}^2$ dipertimbangkan tanah,
- Belakang dinding berada di bawah

Jawab :

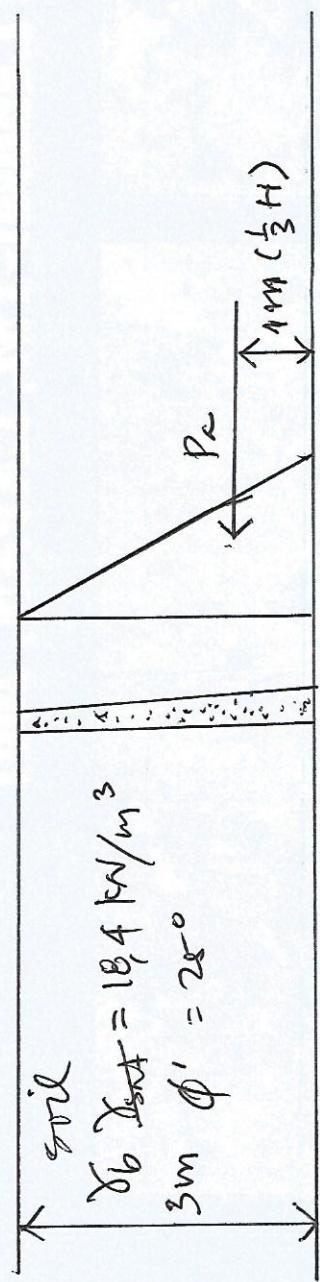
Cari φ' dr diagram $\rightarrow 10 \text{ kN/m}^2$



$$\begin{aligned} H_1 &= \frac{\gamma}{2} \cdot t \cdot H \\ &= \frac{\gamma}{2} \cdot 2 \cdot 10 \\ &= 10,52 \text{ kN/m}^2 \end{aligned} \quad \begin{aligned} H_1 &= H \cdot \tan \phi \\ &= 3,18 \cdot 0,259 \\ &= 7,02 \text{ kN/m}^2 \\ &= 0,259 \end{aligned}$$

$$\begin{aligned} H_2 &= H \cdot g \cdot \sin \phi \\ &= 3 \cdot 10 \cdot 0,173 \\ &= 7,80 \text{ kN/m}^2 \end{aligned}$$

3.1 Deckschicht



$$\tan \phi' = \tan^2 (45 - \frac{\phi'}{2}) = \tan^2 (45 - \frac{25}{2}) = \tan^2 (32,5) = 0,406$$

$$\gamma'_a = \gamma_0 \cdot H \cdot \gamma_m = 18,4 \cdot 3 \cdot 0,406 = 22,41$$

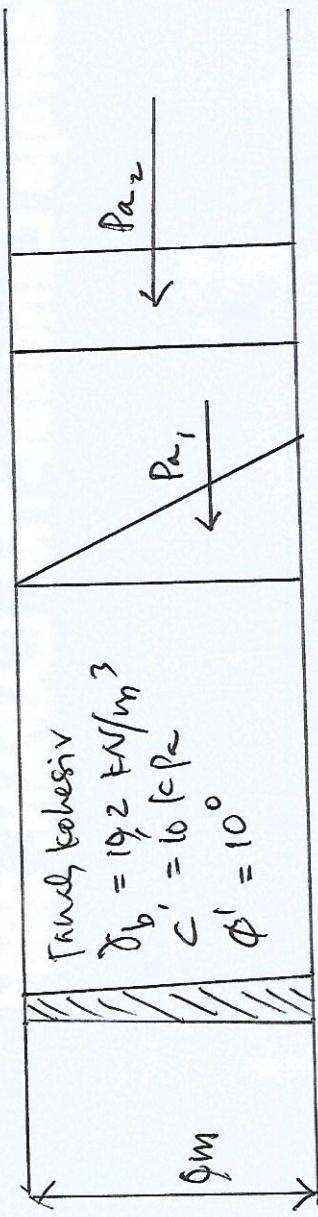
$$P_a = \frac{1}{2} \cdot \gamma'_a \cdot H = \frac{1}{2} \cdot 22,41 \cdot 3 = 33,615 \text{ kN}$$

Socr 4

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3.2

Dilekhui:



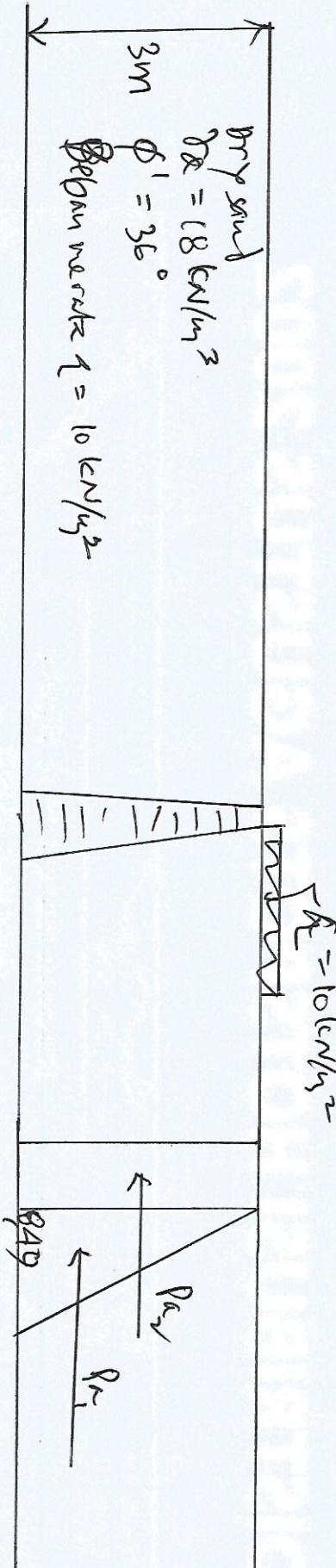
Guna los teri pukine

$$f_m = \tan^2(45 - \frac{\phi'}{2}) = \tan^2(45 - \frac{10}{2}) = \tan^2(40) = 0.904$$

$$\begin{aligned} f'_a &= \gamma_b \cdot H \cdot f_m &= 19,2 \cdot 9 \cdot 0,904 &= 121,65 \\ P_{a_1} &= 1/2 \cdot f'_a \cdot H &= 1/2 \cdot 121,65 \cdot 9 &= 547,45 \text{ kN} \end{aligned}$$

$$P_{a_2} = -Q \cdot f'_a \sqrt{h} = -2 \cdot 19,2 \cdot \sqrt{0,904} = -32,219 \text{ kN}$$

$$P_a = P_{a_1} - P_{a_2} = 547,45 - 32,219 \cdot 6 = 354,111 \text{ kN}$$



$$c_a = \tan^2(45 - \frac{\phi'}{2}) = \tan^2(45 - \frac{36}{2}) = \tan^2(17) = 0,30$$

$$\Gamma_{a_2} = 2 \cdot k_a + 3 \cdot H \cdot \tan_2 - 2 \cdot \sqrt{k_a}$$

$$= 10 \cdot 0,30 + 18 \cdot 3 \cdot 0,30 - 0$$

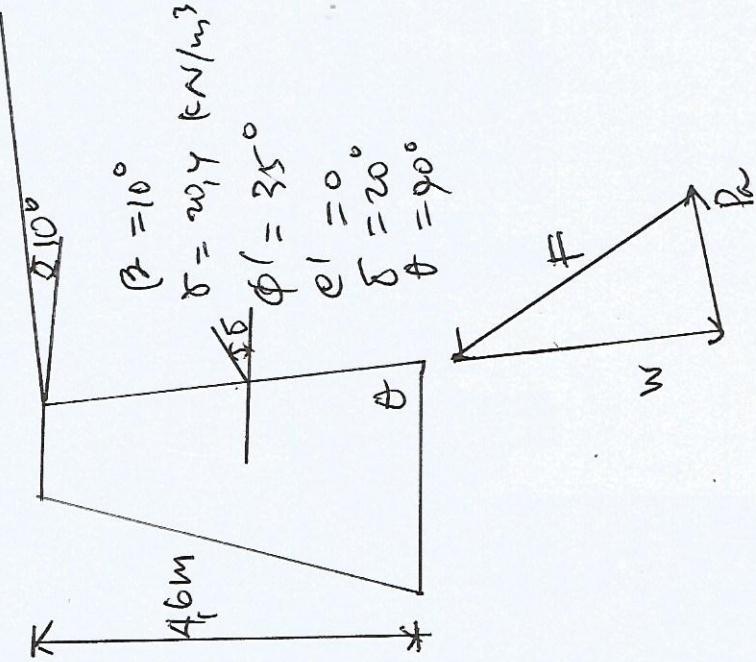
$$= 3,00 + 5,49 = 8,49 \text{ kN/m}^2$$

$$P_a = \frac{1}{2} \cdot 8,49 \cdot 3 = 12,735 \text{ kN}$$

$$P = 12,735 \text{ kN}$$

Soal 4
S.4

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$$\sin^2(\theta + \phi)$$

$$k_n = \frac{\sin^2 \theta (\theta - \delta)}{\sin^2 \theta (\theta - \delta) \left[1 + \sqrt{\sin(\theta + \delta) \sin(\phi - \delta)} \right]}$$

$$k_n = \frac{\sin^2(90 + 35)}{\sin^2 90 (90 - 20)}$$

$$k_n = \frac{\left[1 + \sqrt{\frac{\sin(90 + 20) \sin(35 - 10)}{\sin(90 - 20) \sin(90 + 10)}} \right]}{\sin^2 90 (70) \left[1 + \sqrt{\frac{\sin(110) \sin(25)}{\sin(70) \sin(100)}} \right]}$$

$$0,671$$

$$= \frac{0,116 \left[1 + \sqrt{\frac{0,94 \cdot 0,423}{0,940 \cdot 0,985}} \right]}{0,116 \left[1 + \sqrt{\frac{0,398}{0,926}} \right]} = 5,78 \cdot \frac{1}{1,656} = 3,49$$

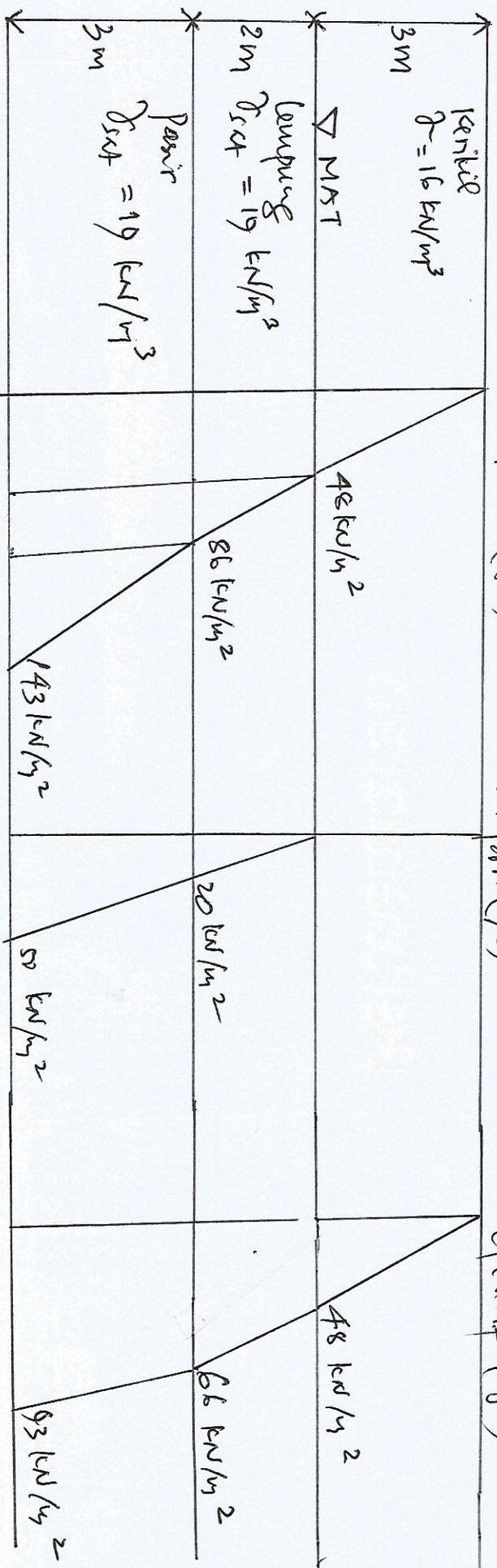
$$P_n = \frac{1}{2} \delta H k_n = \frac{1}{2} \cdot 20,4 \cdot 4,6^2 \cdot 3,49 \\ = 753,253 \text{ kN}$$

(a)

Totak (σ)

Air terti (μ)

efektif (σ')



$$\sigma_w = 10 \text{ kN/m}^3$$

Tekanan air pori (μ) :

kedalaman 3 m, $\mu_e = 0$
kedalaman 5 m, $\mu_e = 2 \text{ m} \cdot \sigma_w = 20 \text{ kN/m}^2$
kedalaman 8 m, $\mu_e = 5 \text{ m} \cdot \sigma_w = 50 \text{ kN/m}^2$

$$\text{Tekanan efektif} (\sigma') = \sigma - \mu_e$$

kedalaman 3 m, $\sigma' = 48 \text{ kN}$

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

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

Tekanan totak (σ):
kedalaman 3 m, $\sigma = 3 \text{ m} \cdot \sigma = 48 \text{ kN/m}^2$
kedalaman 5 m, $\sigma = 3 \cdot 16 + 2 \cdot 19 = 86 \text{ kN/m}^2$
kedalaman 8 m, $\sigma = 86 + 3 \cdot 19 = 143 \text{ kN/m}^2$

kedalaman (m)	σ (kN/m²)	μ_e (kN/m²)	$\sigma' = \sigma - \mu_e$ (kN/m²)
3	48	0	48
5	86	20	66
8	143	50	93