

Corrigé type : Examen 2
Structures

Exercice 01 (6/6)

1- 0.5

$$\omega = \frac{W_W}{W_S} \quad \text{avec } W_S = V \times \gamma_d = 0.001 \times 1500 = 1.5 \text{ kg} \quad \text{0.5}$$

$$W_W = W - W_S = 1.75 - 1.5 = 0.25 \text{ kg} \quad \text{0.5}$$

$$\omega = \frac{0.25}{1.5} \times 100 = 16.66\% \quad \text{0.5}$$

2- 0.5

$$e = \frac{V_V}{V_S} \quad \text{avec: } V_S = \frac{W_S}{\gamma_S} = \frac{1.5}{2700} = 5.55 \times 10^{-4} \text{ m}^3 \quad \text{0.5}$$

$$V_V = V - V_S = 0.001 - 5.55 \times 10^{-4} = 4.44 \times 10^{-4} \text{ m}^3 \quad \text{0.5}$$

$$e = \frac{4.44 \times 10^{-4}}{5.55 \times 10^{-4}} = 0.8 \quad \text{0.5}$$

3- 0.5

$$n = \frac{V_V}{V} = \frac{4.44 \times 10^{-4}}{0.001} = 0.44 \quad \text{0.5}$$

4- 0.5

$$\gamma_{sat} = \frac{W_S + \gamma_W \times V_V}{V} = \frac{1.5 + 10^3 \times 4.44 \times 10^{-4}}{0.001}$$

$$\gamma_{sat} = 1944 \frac{\text{kg}}{\text{m}^3} \quad \text{0.5}$$

Exercice 2 (8/8)

$$b=2n-3 \quad b=7, \quad n=5 \quad 7=2(5)-3$$

1.0

$$\begin{aligned} \sum F/x=0, \quad \sum F/y=0, \quad \sum M/z=0 \\ \sum F/x=0 \rightarrow H_B=15 \text{ KN} \\ \sum F/y=0 \leftrightarrow V_B+V_A=69 \text{ KN} \\ \sum M_F/A=0 \rightarrow V_B=42 \text{ KN} \\ \sum M_F/B=0 \rightarrow V_A=27 \text{ KN} \end{aligned}$$

1.5

$$\begin{aligned} \sum F/y=0 \rightarrow N_{EB}=-20 \text{ KN} \\ \sum F/x=0 \rightarrow N_{ED}=0 \end{aligned}$$

$$\begin{aligned} \sum F/y=0 \rightarrow N_{CA}=-25 \text{ KN} \\ \sum F/x=0 \rightarrow N_{CD}=-15 \text{ KN} \end{aligned}$$

$$\text{Tang}(\alpha)=4/3=1.33 \rightarrow \alpha=53.13^\circ$$

$$\cos(53.13^\circ)=0.6 \quad \sin(53.13^\circ)=0.8$$

$$\sum F/x=0 \leftrightarrow N_{AB}-N_{AD} \cdot 0.6=0 \quad N_{AB}=1.5 \text{ KN}$$

$$\sum F/y=0 \leftrightarrow 27-N_{AC}-N_{AD} \cdot 0.8=0$$

$$N_{AD}=-2.5 \text{ KN}$$

$$\sum F/y=0 \leftrightarrow 42-N_{BE}-N_{BD} \cdot 0.8=0$$

$$N_{BD}=-27.5 \text{ KN}$$

$$\sigma = N/S \leq \bar{\sigma}$$

$$572.92 \text{ daN/cm}^2 < 1000 \text{ daN/cm}^2$$

$$\sigma = \varepsilon \cdot E = (\Delta L/L) \cdot E$$

$$\sigma = N/S$$

$$\Delta L = (N \cdot L) / (S \cdot E) = 1.36 \text{ mm}$$

1

1

$$7 \times 0.5 = 3.5$$

0	N_{ED}	E
20	N_{EB}	
15	N_{CD}	C
25	N_{CA}	
1.5	N_{AB}	A
2.5	N_{AD}	
27.5	N_{BD}	

Exercice 03 (6/6)

(b) coefficient de la poussée et de la butée des terres

$$\text{Sable 1: } K_A = \frac{1 - \sin\phi}{1 + \sin\phi} = \frac{1 - \sin 30}{1 + \sin 30} = \frac{1}{3}$$

0.5

$$\text{Sable 2: } K_A = \frac{1 - \sin\phi}{1 + \sin\phi} = \frac{1 - \sin 25}{1 + \sin 25} = 0,406$$

0.5

b) Calcul des pressions des terres

*Point 1:

$$\sigma'_v = (19 - 10) \times 0 = 0 \text{ kPa}$$

$$\sigma'_A = 0 \times 1/3 = 0 \text{ kPa}$$

$$\mu = 10 \times 0 = 0 \text{ kPa}$$

$$\sigma_A = 0 + 0 = 0 \text{ kPa}$$

*Point 2:

$$\sigma'_v = (19 - 10) \times 3 = 27 \text{ kPa}$$

$$\sigma'_A = 27 \times 1/3 = 9 \text{ kPa}$$

$$\mu = 10 \times 3 = 30 \text{ kPa}$$

$$\sigma_A = 9 + 30 = 39 \text{ kPa}$$

0.75 x2

*Point 3:

$$\sigma'_v = (19 - 10) \times 3 = 27 \text{ kPa}$$

$$\sigma'_A = 27 \times 0,406 = 10,96 \text{ kPa}$$

$$\mu = 10 \times 3 = 30 \text{ kPa}$$

$$\sigma_A = 10,96 + 30 = 40,96 \text{ kPa}$$

*Point 4:

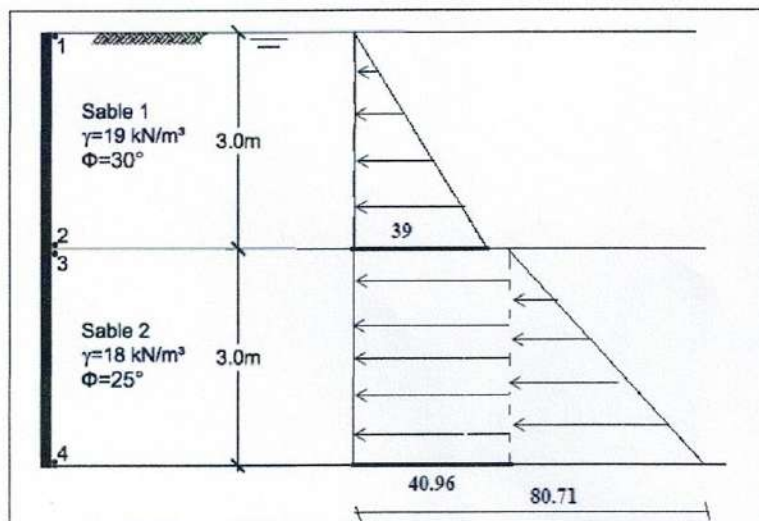
$$\sigma'_v = 27 + (18 - 10) \times 3 = 51 \text{ kPa}$$

$$\sigma'_A = 51 \times 0,406 = 20,71 \text{ kPa}$$

$$\mu = 10 \times 6 = 60 \text{ kPa}$$

$$\sigma_A = 20,71 + 60 = 80,71 \text{ kPa}$$

0.75x2



1.0

c) Calcul des forces et le point d'application de la résultante

1.0

Force	Bras de levier
$F_1 = 39 \times 3 \times 1/2 = 58.5 \text{ KN/ml}$	$Z_1 = 3 + 3/3 = 4\text{m}$
$F_2 = 40.96 \times 3 = 122.88 \text{ KN/ml}$	$Z_2 = 3/2 = 1.5\text{m}$
$F_3 = 39.75 \times 3 \times 1/2 = 59.62 \text{ KN/ml}$	$Z_3 = 3/3 = 1\text{m}$
$R = F = 241$	$Z = 1.98\text{m}$