

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2013

CC502: GEOTECHNICS 2

TARIKH : 29 OKTOBER 2013

TEMPOH : 2 JAM (2.30 PM - 4.30 PM)

Kertas ini mengandungi **EMPAT BELAS (14)** halaman bercetak.

Bahagian A: Struktur (10 soalan)

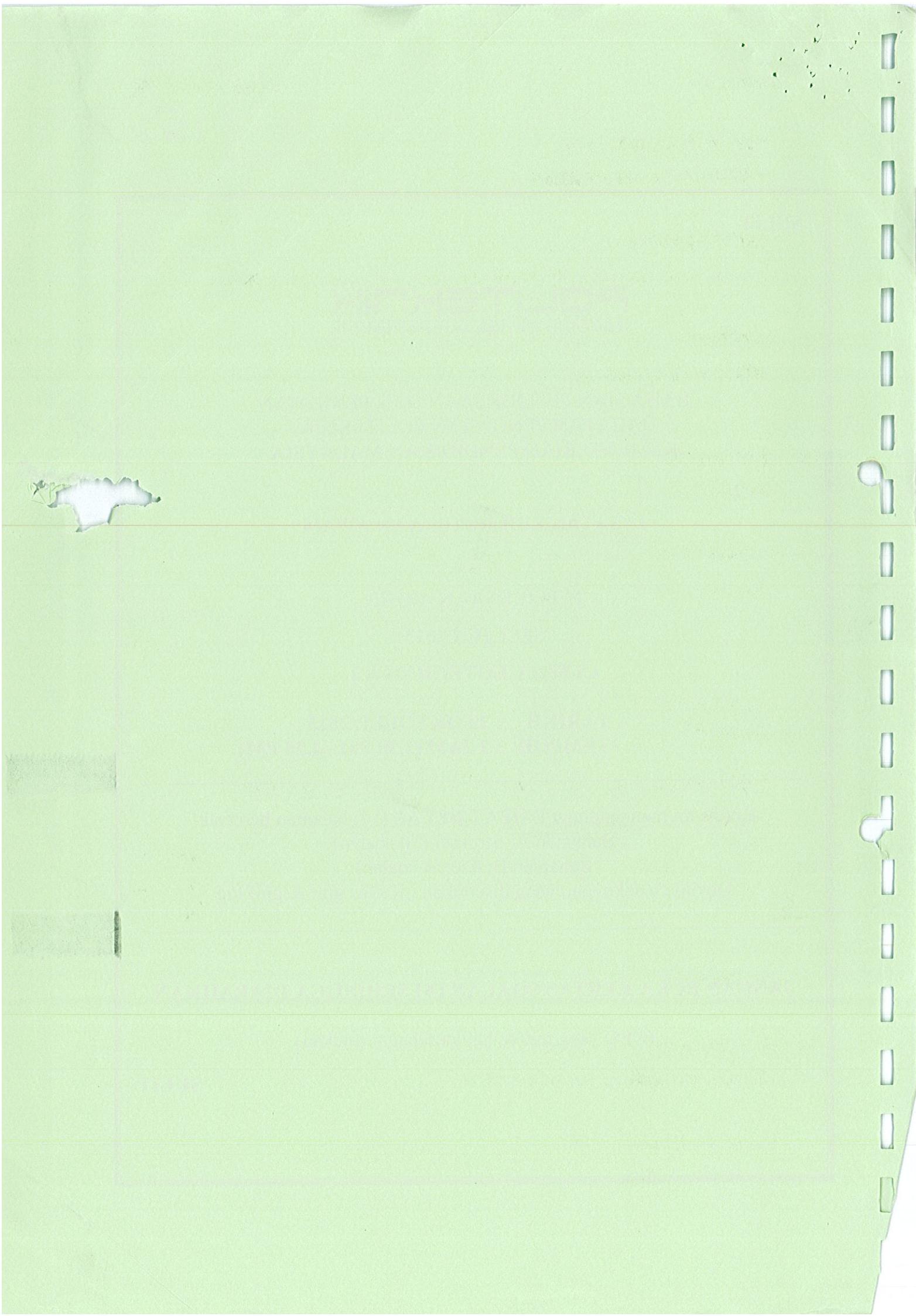
Bahagian B: Esei (4 soalan)

Dokumen sokongan yang disertakan : Kertas graf & graf log

JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT



SECTION A : 40 MARKS***BAHAGIAN A : 40 MARKAH*****INSTRUCTION:**

This section consists of **TEN (10)** short questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi SEPULUH (10) soalan pendek. Jawab semua soalan.

CLO1
C1**QUESTION 1*****SOALAN 1***

State **FIVE (5)** purposes of Site Investigation.

Nyatakan LIMA (5) tujuan Penyiasatan Tapak.

[4 marks]

[4 markah]

CLO1
C2**QUESTION 2*****SOALAN 2***

Explain the important of soil investigation in civil engineering project.

Terangkan kepentingan penyiasatan tapak dalam projek kejuruteraan awam.

[4 marks]

[4 markah]

CLO1
C1**QUESTION 3*****SOALAN 3***

By referring to Figure A3, label :

Berdasarkan kepada Rajah A3, labelkan :

- a) Flow lines.

Garis aliran.

b) Equipotential lines.

Garis sama upaya.

c) Upstream.

Bahagian hulu.

d) Downstream.

Bahagian hilir.

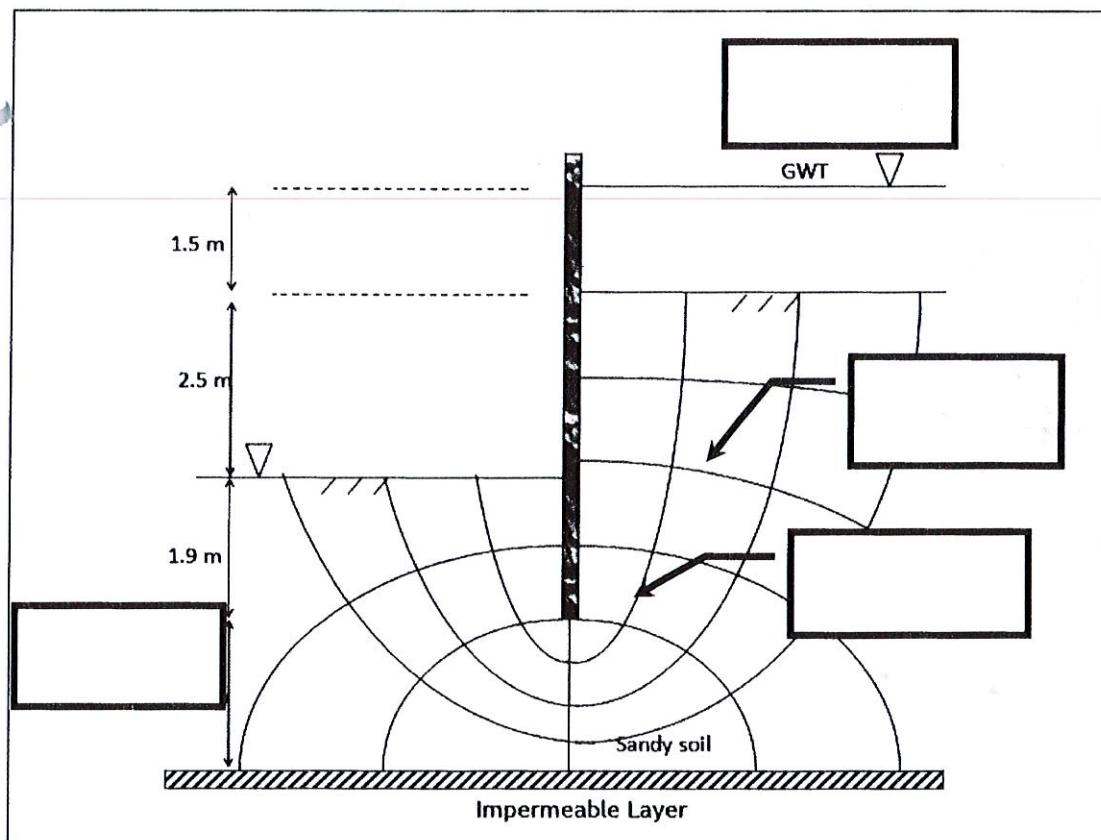


Figure A3 / Rajah A3

[4 marks]

[4 markah]

CLO1
C3**QUESTION 4*****SOALAN 4***

Calculate the safety factor of slope as shown in Figure A4.

Tentukan faktor keselamatan cerun seperti Rajah A4.

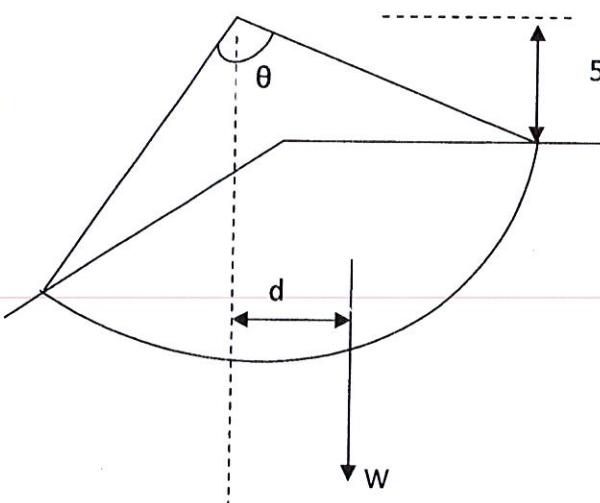


Figure A4/Rajah A4

Soil properties /Sifat tanah:

Unit weight /Berat unit tanah=18.5 kN/m³

C = 5 kN/m³ d= 2 m

Area / Luas = 250 m²

Radius of circle/jejari bulatan = 15 m

$\Theta = 80^0$

[4 marks]

[4 markah]

CLO1
C1**QUESTION 5*****SOALAN 5***

Define concept of active and passive pressure in soil.

Takrifkan konsep tegasan aktif dan pasif yang berlaku dalam tanah.

[4 marks]

[4 markah]

CLO1
C1**QUESTION 6*****SOALAN 6***

Define Shallow Foundation.

Berikan definisi Asas Cetek.

[4 marks]

[4 markah]

CLO1
C2**QUESTION 7****SOALAN 7**

Describe the requirements for a stable foundation?

Terangkan keperluan-keperluan bagi asas yang stabil?

[4 marks]

[4 markah]

CLO1
C1**QUESTION 8****SOALAN 8**

List **FOUR (4)** factors that influence bearing capacity in shallow foundation design.

*Senaraikan **EMPAT (4)** faktor yang mempengaruhi keupayaan galas dalam reka bentuk asas cetek.*

[4 marks]

[4 markah]

CLO1
C1**QUESTION 9****SOALAN 9**

List any situation when the pile foundation is required.

Senaraikan keadaan di mana penggunaan asas cerucuk diperlukan

[4 marks]

[4 markah]

CLO1
C2**QUESTION 10****SOALAN 10**

Piles can be categorized according to their material; steel piles, concrete piles, wooden piles and composite piles. Explain the advantages and disadvantages of **TWO (2)** types of pile for deep foundation construction.

Asas cerucuk boleh dikategorikan berdasarkan bahan yang digunakan iaitu cerucuk keluli, cerucuk konkrit, cerucuk kayu dan cerucuk komposit. Terangkan kelebihan dan kekurangan bagi **DUA (2)** jenis asas cerucuk yang digunakan bagi pembinaan asas dalam.

[4 marks]

[4 markah]

SECTION B : 60 MARKS**BAHAGIAN B : 60 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** stuctured questions. Answer **THREE (3)** questions only.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan struktur. Jawab **TIGA (3)** soalan sahaja.

CLO2
C4**QUESTION 1****SOALAN 1**

Figure B1 below shows a draft of soil dam. The permeability coefficients value of the soil is 4.5×10^{-3} mm/s. Construct a flow net for the soil dam and calculate:

Rajah B1 di bawah menunjukkan keratan bagi empangan tanah. Pekali kebolehtelapan tanah ialah 4.5×10^{-3} mm/s. Lukiskan jaringan aliran bagi empangan tanah tersebut dan kira :

- a) Seepage quantity, (q) in $\text{m}^3/\text{hour}/\text{m length}$.
Kuantiti resipan (q) dalam $\text{m}^3/\text{jam}/\text{m panjang}$.
- b) Pore pressure at point A'.
Tekanan air liang di titik A'.

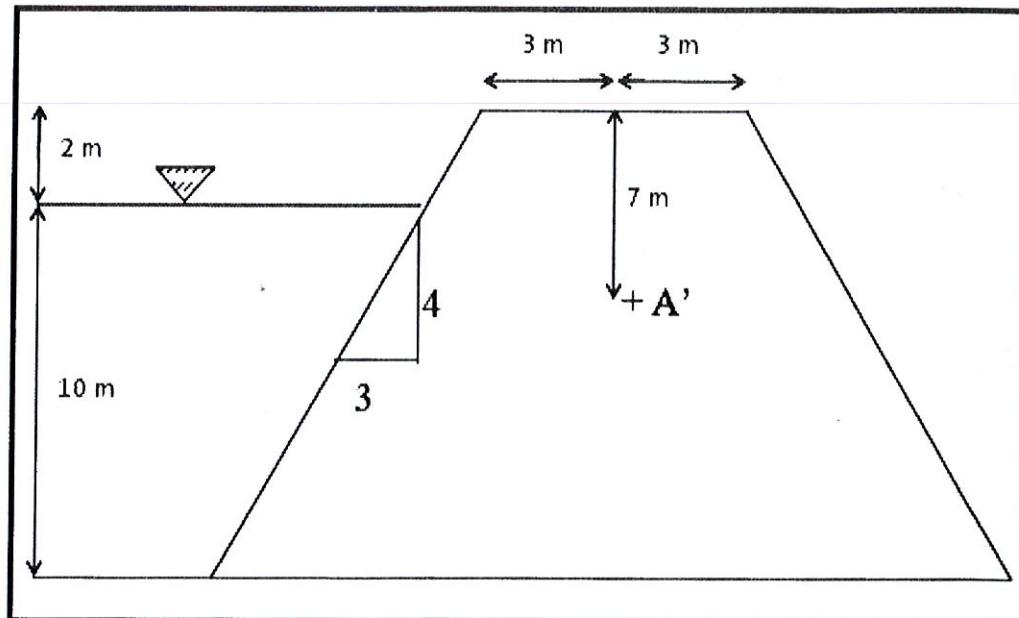


Figure B1/ Rajah B1

[20 marks]

[20 markah]

CLO2
C4

QUESTION 2

SOALAN 2

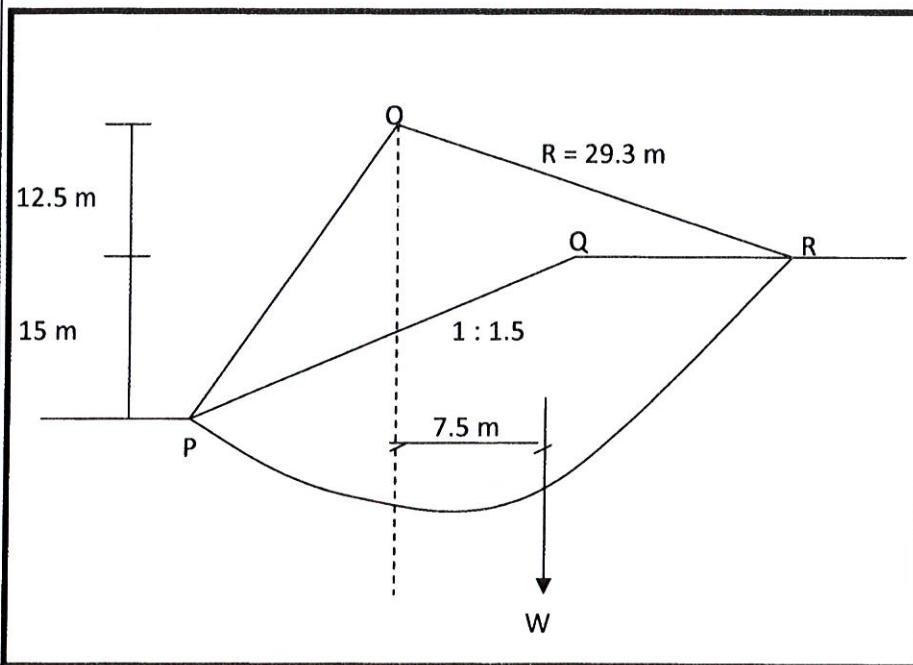


Figure B2/ Rajah B2

The Figure B2 shows a slope with height of 15 m and slope 1:1.5. Given that $c = 38 \text{ kN/m}^2$ and $\gamma = 18.5 \text{ kN/m}^3$. Determine the factor of safety for the slope against the failure plane.

Rajah B2 di atas menunjukkan satu cerun setinggi 15 m dengan kecerunan 1:1.5. Diberi nilai $c = 38 \text{ kN/m}^2$ dan $\gamma = 18.5 \text{ kN/m}^3$. Tentukan faktor keselamatan cerun terhadap kegagalan satah tersebut.

[20 marks]

[20 markah]

QUESTION 3

SOALAN 3

CLO2
C4

- (a) Calculate the total active thrust and point of thrust for the gravity wall given in Figure B3.

Berdasarkan Rajah B3 tentukan jumlah tujah aktif dan jarak tindakan tujah dari dasar tembok graviti.

[12 marks]

[12 markah]

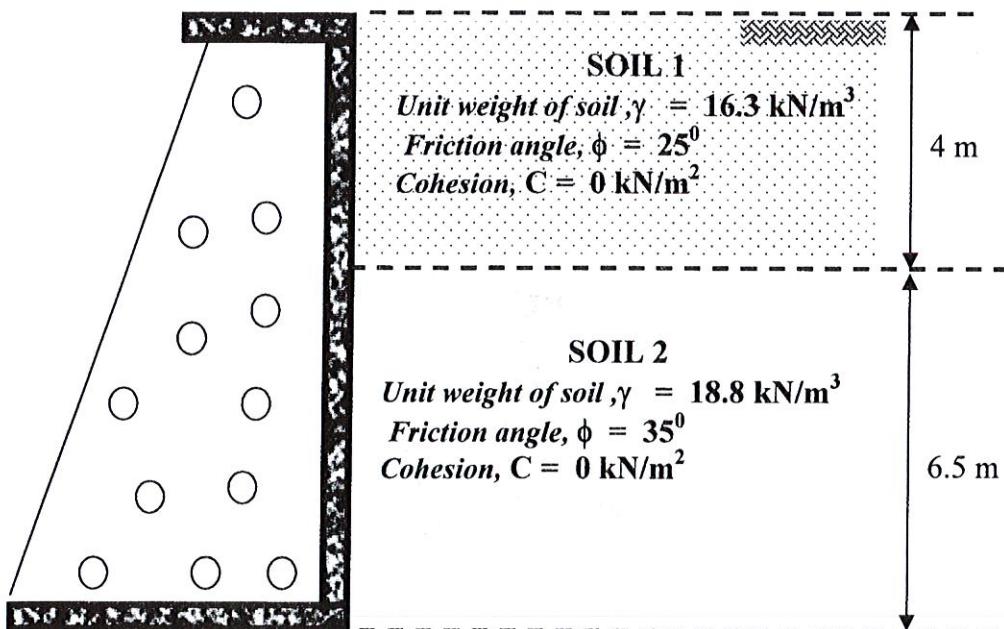


Figure B3/Rajah B3

- (b) By using the answers obtained from Question 3(a), determine the factor of safety against sliding if, $\gamma_{concrete} = 23.5 \text{ kN/m}^3$ and $\delta = 20^\circ$.

Dengan menggunakan jawapan yang diperolehi daripada Soalan 3(a), tentukan faktor keselamatan terhadap gelangsar jika diberi, $\gamma_{concrete} = 23.5 \text{ kN/m}^3$ dan $\delta = 20^\circ$.

[8 marks]

[8 markah]

QUESTION 4

SOALAN 4

CLO2
C4

- a) Figure B4(a) shown a square foundation ($2\text{m} \times 2\text{m}$). The soil supporting the foundation has a friction angle of $\phi' = 25$ and $C' = 20 \text{ kN/m}^2$. The unit weight of soil, γ is 16.5 kN/m^3 . Determine the allowable gross load (Q) on the foundation with a factor of safety (FS) of 3. Assume that the depth of the foundation (D_f) is 1.5 m and general shear failure occurs in the soil.

Rajah B4(a) menunjukkan satu asas segiempat sama. ($2\text{m} \times 2\text{m}$). Tanah yang menyokong asas mempunyai sudut geseran $\phi' = 25$ dan $C' = 20 \text{ kN/m}^2$. Berat unit tanah, γ adalah 16.5 kN/m^3 . Tentukan beban yang dibenarkan kasar (Q) pada asas dengan faktor keselamatan (FS) 3. Andaikan bahawa kedalaman asas (D_f) adalah 1.5 m dan kegagalan rincih am berlaku di dalam tanah

[10 marks]

[10 markah]

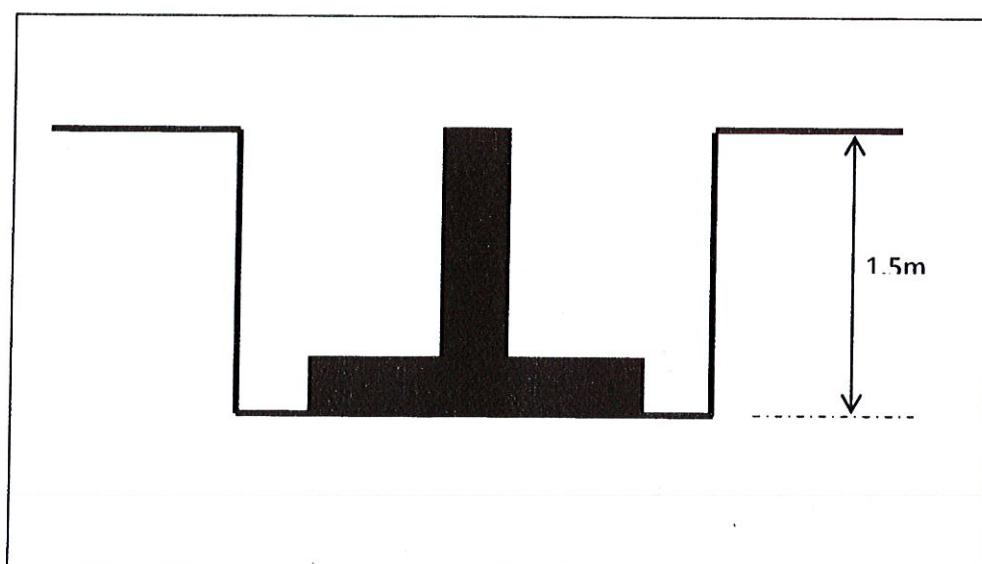


Figure B4(a)/Rajah B4(a)

- b) A strip footing of 2 m wide is placed at a depth of 1 m in stiff clay (Figure B4(b)). A soft clay layer exists at 1 m below the footing base. Groundwater table coincide the interface between the two layers of soil. Determine the allowable load of the footing for a factor of safety 3.

Satu asas jalur 2m lebar diletakkan pada kedalaman 1m dalam tanah liat keras (Rajah B4(b)). Satu lapisan tanah liat lembut wujud pada 1m di bawah lapisan asas. Paras air tanah berada pada dua lapisan tanah. Tentukan beban yang dibenarkan tapak bagi faktor keselamatan 3.

[10 marks]

[10 markah]

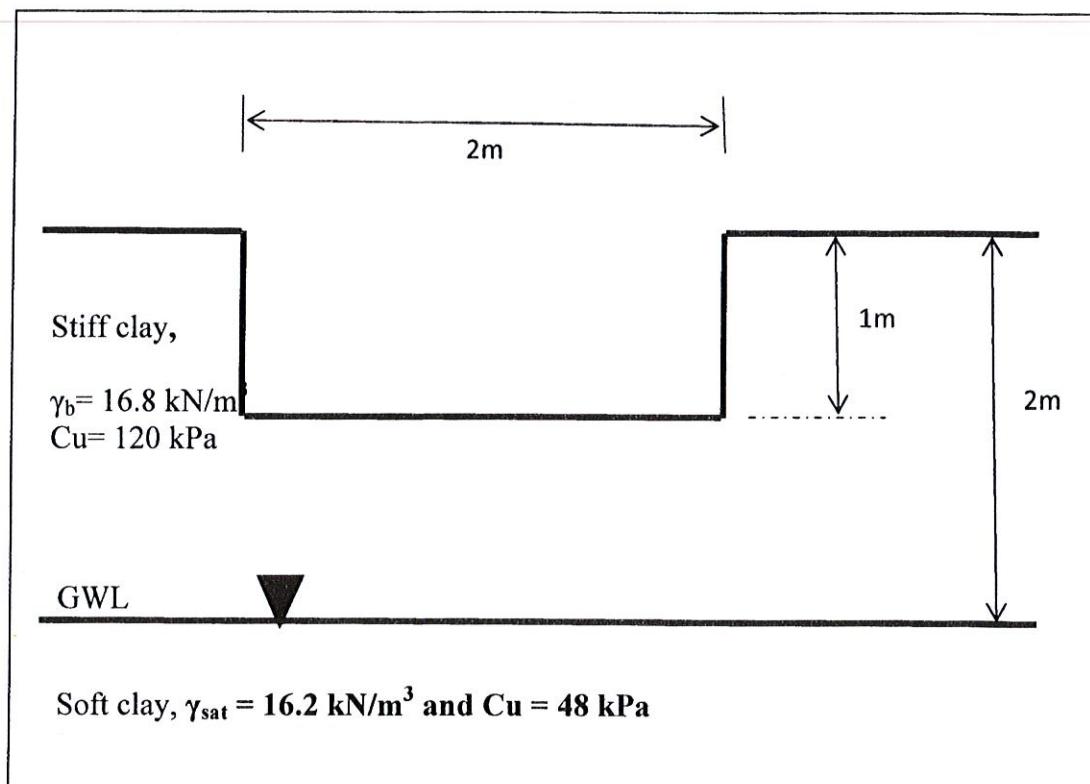


Figure B4(b)/Rajah B4(b)

[20 marks]

[20 markah]

LAMPIRAN FORMULA (CC502 – GEOTECHNICS 2)

$$Q = k H \frac{N_f}{N_e}$$

$$FOS = \frac{CR^2\theta}{Wd}$$

$$i = \frac{\Delta h}{\Delta s}$$

$$FOS = \frac{C_A R^2 \theta_A + C_B R^2 \theta_B}{Wd}$$

$$u = \gamma_w [h - (-z)]$$

$$P = \frac{Rv}{B} \left(1 \pm \frac{6e}{B} \right)$$

$$K_a = \frac{1 - \sin \phi}{1 + \sin \phi}$$

$$FOS = \frac{Rv \tan \delta}{RH}$$

$$K_p = \frac{1 + \sin \phi}{1 - \sin \phi}$$

$$e = B/2 - X$$

$$K_a = \cos \beta \cdot \frac{\cos \beta - \sqrt{(\cos^2 \beta - \cos^2 \phi)}}{\cos \beta + \sqrt{(\cos^2 \beta - \cos^2 \phi)}}$$

$$FOS = \frac{\mu R}{\mu T}$$

$$K_a = \frac{\sin^2(\alpha + \phi) \cos \delta}{\sin \alpha \sin(\alpha - \delta) \left[1 + \sqrt{\frac{\sin(\phi + \delta) \sin(\phi - \beta)}{\sin(\alpha - \delta) \sin \alpha + \beta}} \right]^2}$$

$$FOS = \frac{N_c C_u}{\gamma Z}$$

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

$$FOS = \frac{Cu}{N\gamma Z}$$

$$Z_c = \frac{2C}{\gamma} \sqrt{\frac{1}{Ka}}$$

$$FOS = \frac{\sum CL' + w \cos \alpha \tan \phi}{\sum w \sin \alpha}$$

$$\sigma_a = ka [\gamma Z + q] - 2C\sqrt{Ka}$$

$$FOS = \frac{\sum CL'(W \cos \alpha - \mu L')}{\sum W \sin \alpha}$$

$$Z_c = \frac{2C}{\gamma} \sqrt{\frac{1}{Ka}}$$

$$FOS = \frac{CR^2\theta'}{Wd + PwYc}$$

Correction Table $\frac{\Delta a}{a + \Delta a}$ **Earth Dam (Non Filter)**

Slope, α	30	60	90	120	150	180
$\frac{\Delta a}{a + \Delta a}$	0.37	0.32	0.25	0.18	0.10	0

STRIP FOUNDATION

$$q_u = c_u N_c + \gamma D N_q + 0.5 \gamma B N_\gamma$$

CIRCLE FOUNDATION

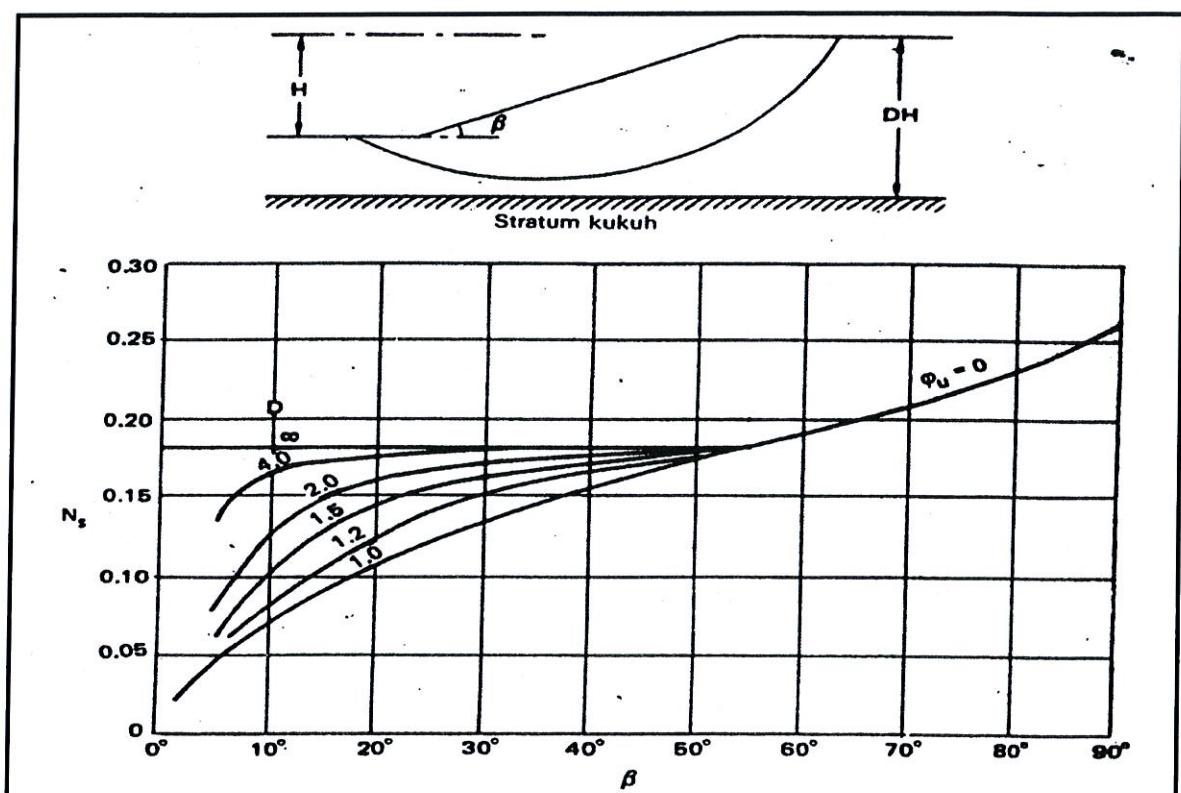
$$q_u = 1.3 c_u N_c + \gamma D N_q + 0.3 \gamma B N_\gamma$$

SQUARE SPREAD FOUNDATION

$$q_u = 1.3 c_u N_c + \gamma D N_q + 0.4 \gamma B N_\gamma$$

RECTANGLE SPERAD FOUNDATION

$$q_u = c_u N_c [1 + 0.3 (B/L) + \gamma D N_q + 0.5 \gamma B N_\gamma [1 - 0.2 (B/L)]]$$

Taylor Stabilization Chart

BARING CAPACITY FACTORS FOR GENERAL SHEAR

ANGLE OF FRICTION ϕ (DEGREES)	TERZAGHI			MEYERHOF			TANSEN		
	N_c	N_q	N_y	N_c	N_q	N_y	N_c	N_q	N_y
0	5.70	1.00	0.00	5.10	1.00	0.00	5.10	1.00	0.00
2	6.30	1.22	0.18	5.63	1.20	0.01	5.63	1.20	0.01
4	6.97	1.49	0.38	6.19	1.43	0.04	6.19	1.43	0.05
5	7.34	1.64	0.50	6.49	1.57	0.07	6.49	1.57	0.07
6	7.73	1.81	0.62	6.81	1.72	0.11	6.81	1.72	0.11
8	8.60	2.21	0.91	7.53	2.06	0.21	7.53	2.06	0.22
10	9.60	2.69	1.21	8.34	2.47	0.37	8.34	2.47	0.39
12	10.76	3.29	1.70	9.28	2.97	0.60	9.28	2.97	0.63
14	12.11	4.02	2.23	10.37	3.59	0.92	10.37	3.59	0.97
15	12.86	4.45	2.50	10.98	3.94	1.13	10.98	3.94	1.18
16	13.68	4.92	2.94	11.63	4.34	1.37	11.63	4.34	1.43
18	15.52	6.04	3.87	13.10	5.26	2.00	13.10	5.26	2.08
20	17.69	7.44	4.97	14.83	6.40	2.87	14.83	6.40	2.95
22	20.27	9.19	6.61	16.88	7.82	4.07	16.88	7.82	4.13
24	23.36	11.40	8.58	19.32	9.60	5.72	19.32	9.60	5.75
25	25.13	12.72	9.70	20.72	10.66	6.77	20.72	10.66	6.76
26	27.09	14.21	11.35	22.25	11.85	8.00	22.25	11.85	7.94
28	31.61	17.81	15.15	25.80	14.72	11.19	25.80	14.72	10.94
30	37.16	22.46	19.73	30.14	18.40	15.67	30.14	18.40	15.07
32	44.04	28.52	27.49	35.49	23.18	22.02	35.49	23.18	20.79
34	52.64	36.50	36.96	42.16	29.44	31.15	42.16	29.44	28.77
35	57.75	41.44	42.40	46.12	33.30	37.15	46.12	33.30	33.92
36	63.53	47.16	51.70	50.59	37.75	44.43	50.59	37.75	40.05
38	77.50	61.56	73.47	61.35	48.93	64.07	61.35	48.93	56.17
40	95.66	81.27	100.39	75.31	64.20	93.69	75.31	64.20	79.54
42	119.67	108.75	165.69	93.71	85.37	139.32	93.71	85.37	113.96
44	151.95	147.74	248.29	118.37	115.31	211.41	118.37	115.31	165.58
45	172.29	173.29	294.50	133.87	134.87	282.74	133.87	134.87	200.81
46	196.22	204.19	426.96	152.10	158.50	328.73	152.10	158.50	244.65
48	258.29	287.85	742.61	199.26	222.30	526.45	199.26	222.30	368.67
50	347.51	415.15	1153.15	266.88	319.06	873.86	266.88	319.06	568.57

