

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2016

CC502: GEOTECHNICS 2

TARIKH : 5 NOVEMBER 2016

TEMPOH : 8.30 AM – 10.30 AM (2 JAM)

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

Bahagian A: Soalan Pendek (10 soalan)

Bahagian B: Soalan Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula dan Kertas Graf

JANGAN BUKA KERTAS SOALAN INI 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 **FOUR (4)** purposes of soil exploration.

*Nyatakan **EMPAT (4)** tujuan penerokaan tanah.*

[4 marks]

[4 markah]

CLO1
C2

QUESTION 2**SOALAN 2**

Explain the following activities for site investigation which need to be conducted in program planning:

Terangkan Perancangan Program Penyiasatan Tapak yang berikut:

- a) Gathering the information of proposed site
Pengumpulan maklumat sedia ada di kawasan tapak cadangan projek

- b) Site visit
Lawatan tapak

[4 marks]

[4 markah]

CLO1
C1
QUESTION 3
SOALAN 3

Define flow lines and equipotential lines in a flow net.

Takrifkan garisan aliran dan garisan sama upaya dalam jaringan aliran.

[4 marks]

[4 markah]

CLO1
C3
QUESTION 4
SOALAN 4

Sketch **TWO (2)** examples of slope failure mode.

Lakarkan DUA (2) contoh mod kegagalan cerun.

[4 marks]

[4 markah]

CLO1
C1
QUESTION 5
SOALAN 5

List **TWO (2)** types of gravity wall and reinforce concrete retaining wall.

Senaraikan DUA (2) contoh tembok graviti dan tembok konkrit bertulang.

[4 marks]

[4 markah]

CLO1
C1
QUESTION 6
SOALAN 6

Define a shallow foundation and a deep foundation.

Berikan definisi asas cetek dan asas dalam.

[4 marks]

[4 markah]

CLO1
C2
QUESTION 7
SOALAN 7

Describe **FOUR (4)** factors in selection of a foundation.

Terangkan EMPAT (4) faktor yang perlu diambil kira dalam pemilihan jenis asas.

[4 marks]

[4 markah]

CLO1
C1
QUESTION 8
SOALAN 8

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

Kenal pasti EMPAT (4) faktor yang mempengaruhi dalam reka bentuk asas cetek

[4 marks]

[4 markah]

CLO1
C1
QUESTION 9
SOALAN 9

Methods of pile driving are classified according to various criteria. List **TWO (2)** types of pile driving for Pile Installation Method

Kaedah pemasangan cerucuk dikelaskan mengikut beberapa kriteria. Senaraikan DUA (2) jenis pemasangan cerucuk untuk Kaedah Pemasangan Cerucuk.

[4 marks]

[4 markah]

CLO1
C2
QUESTION 10
SOALAN 10

Explain the behavior of piling in granular soil and cohesion soil.

Terangkan keadaan di mana penggunaan asas cerucuk bagi tanah berbutir dan tanah jelekit.

[4 marks]

[4 markah]

SECTION B : 60 MARKS

BAHAGIAN B : 60 MARKAH

INSTRUCTION:

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

ARAHAN:

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

CLO 2
C4

QUESTION 1

SOALAN 1

Based on **Figure B1**, draw a flow net and identify :

Berdasarkan **Rajah B1**, lukiskan jaringan aliran dan seterusnya dapatkan :

- Quantity of Seepage flow under the sheet piles if given $k = 7.2 \times 10^{-3}$ mm/s.
Kadar alir resipan di bawah cerucuk keping jika diberi $k = 7.2 \times 10^{-3}$ mm/s.
- Pore water pressure at point X.
Tekanan air liang di titik X.
- The critical hydraulic gradient under excavation.
Kecerunan hidraul genting di bawah korekan.
- Power dissipation at point Y.
Daya resipan pada titik Y.

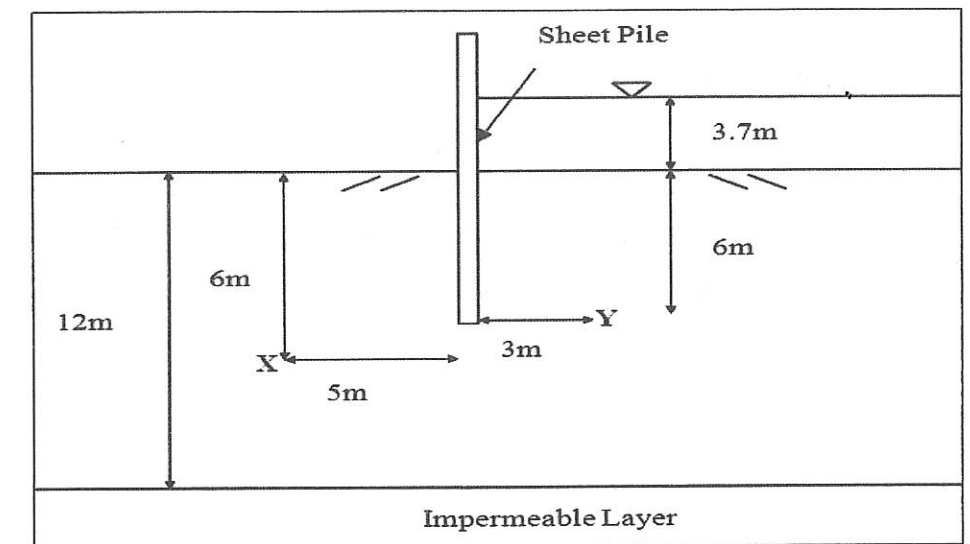


Figure B1/ Rajah B1

[20 marks]

[20 markah]

CLO2
C4

QUESTION 2

SOALAN 2

Figure B2 shows a cutting slope in a saturated clay. Determine the factor of safety against immediate shear failure along the slip circle.

Rajah B2 menunjukkan potongan cerun daripada tanah liat tepu. Tentukan faktor keselamatan bagi cerun di bawah.

- Ignoring the tension crack,
Dengan mengabaikan kesan retak tegangan,
- Allowing for the tension crack empty of water, and
Mengambil kira kesan retak tegangan yang tidak ada air, dan
- Allowing for the tension crack when full of water.
Mengambil kira kesan retak tegangan yang dipenuhi air.

Given:

Diberi:

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

$$C = 30 \text{ kN/m}^2$$

$$\phi = 0$$

Assume $d=3.6\text{m}$ and after tension crack $d'=3.1\text{m}$

Andaikan $d=3.6\text{m}$ dan selepas retak tegangan $d'=3.1\text{m}$

[20 marks]

[20 markah]

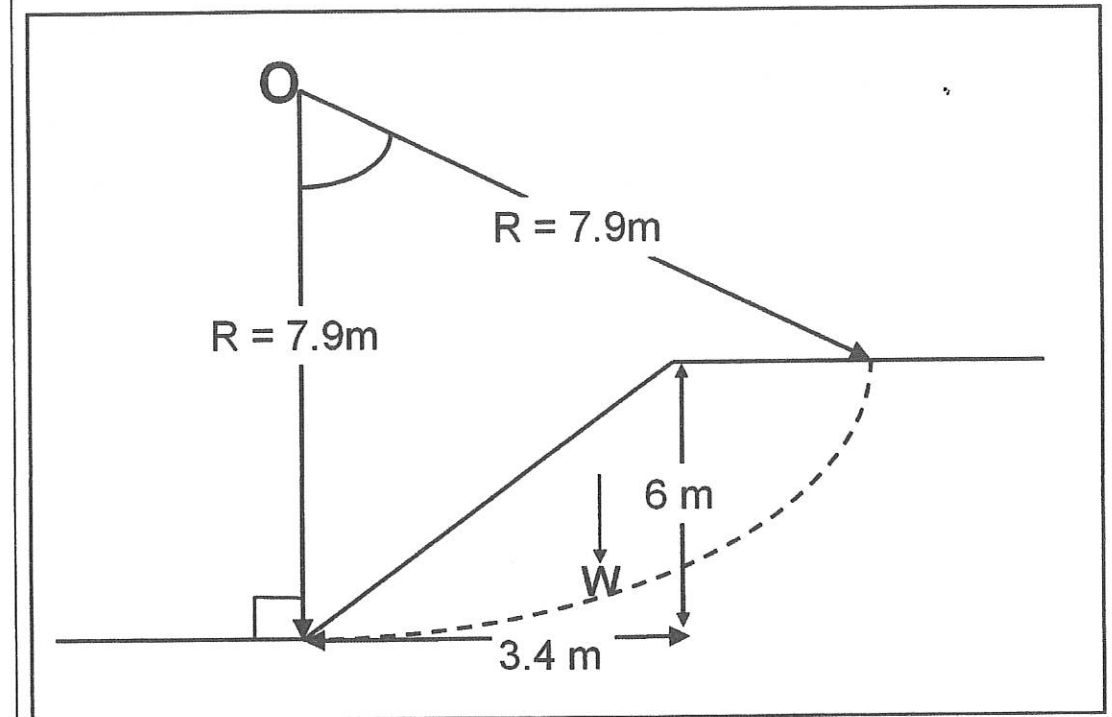


Figure B2/ Rajah B2

QUESTION 3

SOALAN 3

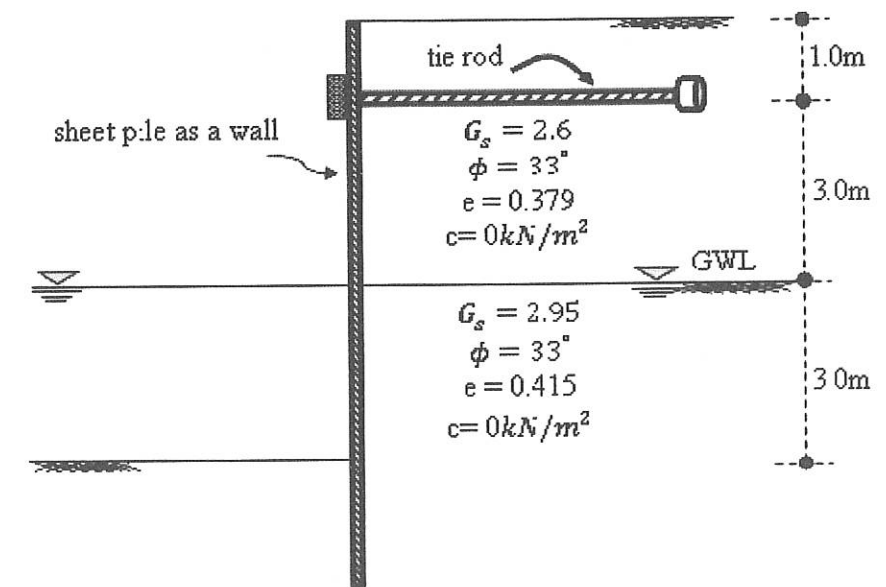


Figure B3 / Rajah B3

A sheet pile wall as shown in **Figure B3** is to be designed using the free earth support method. The safety factor given is 2 for passive resistance.

Satu cerucuk tembok kepingan seperti yang ditunjukkan dalam Rajah B3 akan direka bentuk dengan menggunakan kaedah sokongan bebas. Diberi faktor keselamatan adalah 2 untuk rintangan pasif.

CLO2
C2

- a) Sketch the diagram of lateral pressure.

Lakarkan gambarajah tekanan sisi.

[2 Marks]

[2 Markah]

CLO2
C3

- b) Determine the active and passive force.

Tentukan daya aktif dan pasif.

[7 Marks]

[7 Markah]

CLO2
C3

- c) Determine the depth of the wall penetration required.

Tentukan kedalaman penusukan tembok yang diperlukan.

[8 Marks]

[8 Markah]

CLO2
C4

- d) Calculate the minimum required force in the tie rod.

Kirakan daya minimum yang diperlukan dalam rod.

[3 Marks]

[3 Markah]

QUESTION 4

SOALAN 4

CLO2
C3

- a) A square footing receives the loading from main structure of 300kN. The depth of the footing is 1.5m. Determine the size of the footing if the factor of safety is 2.5. Site investigation properties of soil is given below :

Asas segiempat sama menerima beban dari struktur utama sebanyak 300kN.

Kedalaman asas ialah 1.5m. Dapatkan saiz asas jika factor keselamatan ialah 2.

Penyiasatan tapak memberikan nilai seperti berikut:

Cohesiveness, $C=30\text{kN/m}^2$

Kejelikitan, $C = 30 \text{ kN/m}^2$

Friction of the soil, $\phi=24^\circ$

Sudut geseran, $\phi = 24^\circ$

Unit weight, $\gamma=18\text{kN/m}^3$

Berat unit tanah, $\gamma = 18 \text{ kN/m}^3$

[10 marks]

[10 markah]

CLO2
C4

- b) A strip footing is subjected to vertical load of 280kN and horizontal load of 100kN. The width of the footing is 3m and the depth is 1m. From site investigation, given below:

Sebuah asas jalur mempunyai beban menegak sebanyak 280kN dan beban mendatar sebanyak 100kN. Lebar asas ialah 3m dan kedalaman asas ialah 1m. Penyiasatan tapak memberikan nilai seperti berikut:

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

$$\text{Berat unit tanah} = 18\text{kN/m}^3$$

$$\text{Cohesiveness} = 0\text{kN/m}^2$$

$$\text{Kejelikitan} = 0\text{kN/m}^2$$

$$\text{Angle of friction} = 30^\circ$$

$$\text{Sudut geseran} = 30^\circ$$

By using factor of safety FS=3.0, determine the safe bearing capacity.

Dengan menggunakan nilai faktor keselamatan FS=3.0, tentukan keupayaan galas selamat.

[10 marks]

[10 markah]

SOALAN TAMAT

LAMPIRAN FORMULA (CC502 – GEOTECHNICS 2)

$$Q = k H \frac{Nf}{Ne}$$

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

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

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

$$u_x = u_w \left(\frac{N_x}{N_s} \cdot \Delta H - (-Z_x) \right)$$

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

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

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

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

$$e = B/2 - \bar{X}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

$$q_u = c_u N_c + \gamma DN_q + 0.5 \gamma BN_\gamma$$

CIRCLE FOUNDATION

$$q_u = 1.3c_u N_c + \gamma DN_q + 0.3 \gamma BN_\gamma$$

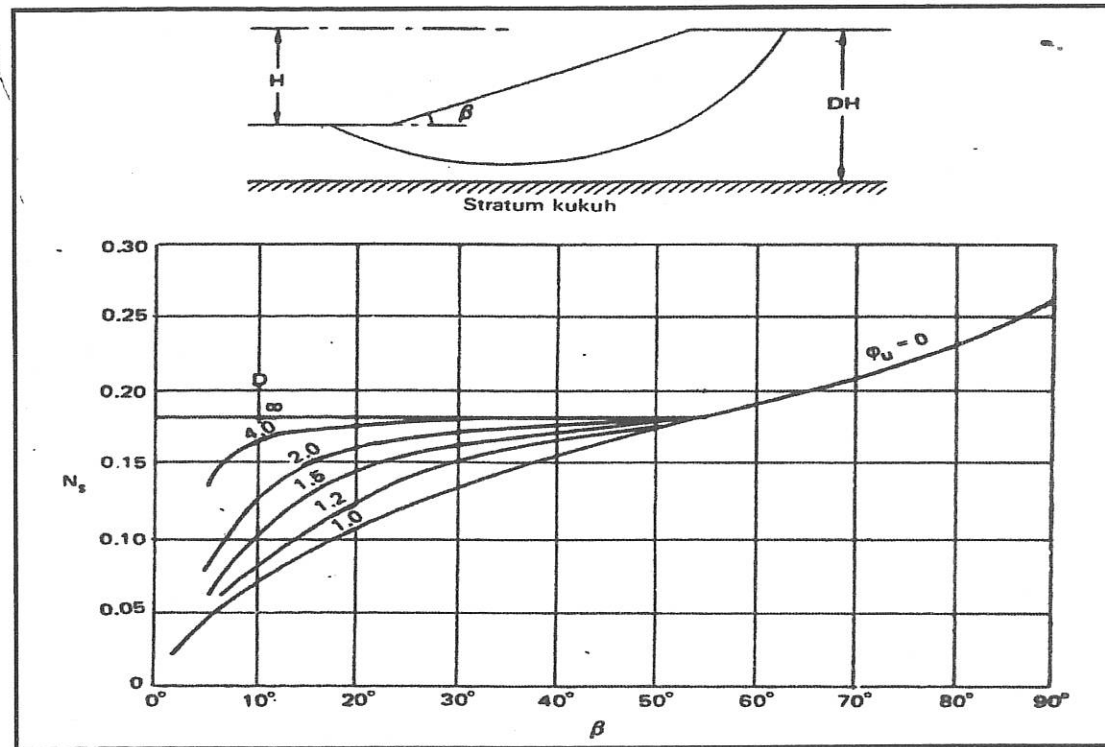
SQUARE SPREAD FOUNDATION

$$q_u = 1.3c_u N_c + \gamma DN_q + 0.4 \gamma BN_\gamma$$

RECTANGLE SPERAD FOUNDATION

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

Taylor Stabilization Chart



LOADING CAPACITY FACTORS FOR GENERAL SHEAR

ANGLE OF FRICTION ϕ (DEGREES)	TERZAGHI			MEYERHOF			HANSEN		
	N_c	N_q	N_γ	N_c	N_q	N_γ	N_c	N_q	N_γ
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	61.55	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	262.74	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