SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2015

CC502 : GEOTECHNICS 2

TARIKH : 3 NOVEMBER 2015
MASA : 2.30 PM – 4.30 PM (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.
Bahagian A: Soalan Pendek (10 soalan)
Bahagian B: Soalan Struktur (4 soalan)
Dokumen sokongan yang disertakan : Kertas Graf, Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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

List down **FOUR (4)** information that can be gathered from a subsurface exploration of a site investigation.

*Senaraikan **EMPAT (4)** maklumat yang boleh dikumpul daripada penerokaan sub-permukaan tanah dalam Penyiasatan Tapak.*

[4 marks]

[*4 markah*]

CLO1
C2

QUESTION 2

SOALAN 2

Explain the functions of Hand Auger.

Terangkan fungsi gerimit tangan.

[4 marks]

[*4 markah*]

CLO1
C1

QUESTION 3

SOALAN 3

Flow net can represent the seepage under the dam. Sketch a flow net for the sheet pile and label flow line and equipotential line.

Jaringan aliran boleh mewakili kadar resipan di bawah empangan. Lukiskan jaringan aliran untuk cerucuk keping dan labelkan garis aliran dan garis sama upaya.

[4 marks]

[*4 markah*]

CLO1
C3

QUESTION 4

SOALAN 4

One form of slope failure is the failure of flow. Provide a brief description of this type of failure.

Salah satu bentuk kegagalan cerun adalah kegagalan aliran, huraikan dengan ringkas jenis kegagalan ini.

[4 marks]

[*4 markah*]

CLO1
C1

QUESTION 5

SOALAN 5

List down **FOUR (4)** types of slope failure.

*Senaraikan **EMPAT (4)** jenis kegagalan cerun.*

[4 marks]

[*4 markah*]

CLO1
C1

QUESTION 6

SOALAN 6

Draw **TWO (2)** types of shallow foundation .

*Lukiskan **DUA(2)** contoh asas cetek.*

[4 marks]

[4 *markah*]

CLO1
C2

QUESTION 7

SOALAN 7

Describe the differences between shallow foundation and deep foundation.

Nyatakan perbezaan antara asas cetek dan asas dalam.

[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.*

CLO2
C4

QUESTION 1

SOALAN 1

A concrete dam with a sheet pile impounds water to a height of 10m as shown in **Figure B1**. Make a sketch of a flow net for seepage under the concrete dam by using 1cm : 2m scale. Determine the seepage discharge in m^3/hr/m length if the soil beneath ground level has a permeability of 2.15×10^{-3} mm/sec. Calculate pore water pressure at point X, assuming datum from upstream.

*Empangan konkrit dengan cerucuk keping seperti **Rajah B1** menampung air setinggi 10m. Lakarkan jaringan aliran bagi resipan di bawah empangan konkrit dengan menggunakan skala 1cm : 2m. Tentukan kadaralir resipan dalam unit m^3/jam/m panjang jika diberi pekali kebolehtelapan tanah of 2.15×10^{-3} mm/s. Kirakan juga tekanan liang tanah pada point X, dengan andaian datum adalah dari hilir empangan.*

[20 marks]
[*20 markah*]

CLO1
C1

QUESTION 8

SOALAN 8

List down **FOUR (4)** factors that can 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

State **TWO (2)** reasons Pile Load Test is required for the design of piles.

*Nyatakan **DUA (2)** sebab Ujian Beban Cerucuk diperlukan dalam reka bentuk cerucuk.*

[4 marks]

[*4 markah*]

CLO1
C2

QUESTION 10

SOALAN 10

Identify **FOUR (4)** circumstances in selection of piles for a project.

*Kenal pasti **EMPAT (4)** keadaan dalam pemilihan cerucuk untuk sesuatu projek.*

[4 marks]

[*4 markah*]

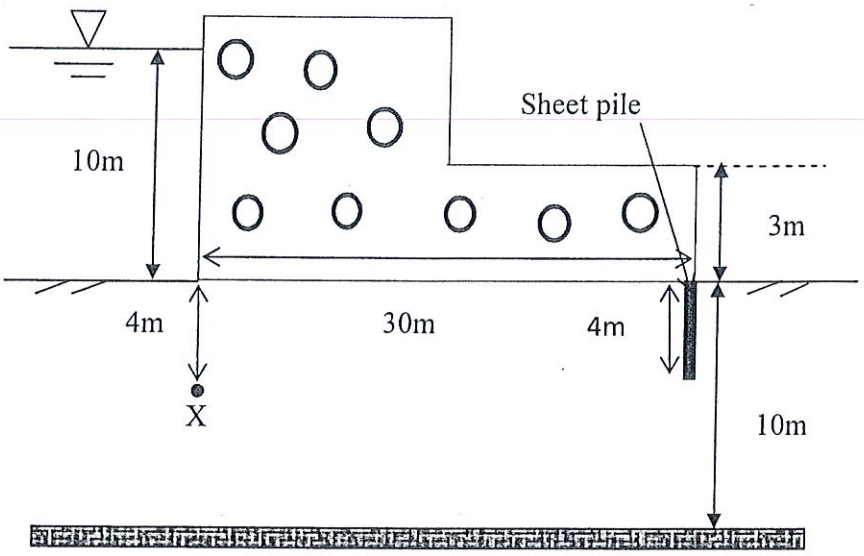


Figure B1

Rajah B1

CLO2
C4

QUESTION 2

SOALAN 2

Based on the information given in **Table B2**, calculate the safety of the slope and determine if the slope is safe or not.

*Berdasarkan kepada **Jadual B2**, kira faktor keselamatan bagi cerun tersebut dan semak sama ada cerun tersebut selamat atau tidak.*

The properties of soil are :

Ciri-ciri tanah adalah seperti berikut :

$C = 20\ kN/m^2$, $\gamma = 20\ kN/m^3$; $\phi = 15^0$

Table B2

Jadual B2

No of slice/ No hirisan	α	Z(m)	b(m)
1	3	0.5	1.0
2	10^0	1.3	1.0
3	16^0	2.1	1.0
4	23^0	2.8	1.0
5	30^0	3.3	1.0
6	37^0	3.1	1.0
7	46^0	2.2	1.0
8	55^0	0.95	1.0

[20 marks]

[20 markah]

QUESTION 3

SOALAN 3

A retaining wall of 6 m high with a vertical back face retains a homogeneous saturated soft clay. The saturated unit weight of the clay is 30 kN/m^3 and the angle of friction of soil is 30^0. Laboratory test showed that the undrained shear strength,c_u of the clay is 16.8 kN/m^2.

Sebuah tembok penahan tegak setinggi 6 m dengan permukaan mendatar menahan tanah liat lembut tepu. Berat unit tepu bagi tanah liat ialah 30 kN/m^3 dan sudut geseran tanah ialah 30^0. Ujian di makmal menunjukkan kekuatan ricih tak tersalir,c_u bagi tanah liat ialah 16.8 kN/m^2.

CLO2
C3

a) Calculate the depth up to which a tensile crack can occur.
Kira kedalaman retak tegangan.

[4 marks]

[4 markah]

CLO2
C3

b) Sketch and calculate the distribution of Rankine's active pressure on the wall with depth.
Lakarkan dan kira kedalaman taburan tekanan aktif Rankine yang bertindak di belakang tembok mengikut kedalaman.

[8 marks]
[8 markah]

CLO2
C4

c) Determine the total active force per unit length of the wall before the tensile crack occurs.
Tentukan jumlah tujah aktif per unit panjang sebelum retak tegangan berlaku.

[4 marks]
[4 markah]

CLO2
C4

d) Determine the total active force per unit length of the wall after the tensile crack occurs.
Tentukan jumlah tujah aktif per unit panjang selepas retak tegangan berlaku.

[4marks]
[4 markah]

CLO2
C4

QUESTION 4

SOALAN 4

A strip footing is to be placed at a depth of 1.2 m below ground level. The footing will carry a total load of 600 kN/m. Determine the size of footing using a factor of safety of 3.

Satu asas jalur berada pada kedalaman 1.2 m di bawah aras tanah. Asas tersebut akan menanggung beban sebanyak 600 kN/m. Tentukan saiz asas (B) tersebut menggunakan faktor keselamatan 3.

Given : $\emptyset = 32^{\circ}$; $C = 15\ kN/m^2$; $\gamma = 18\ kN/m^3$

Diberi : $\emptyset = 32^{\circ}$; $C = 15\ kN/m^2$; $\gamma = 18\ kN/m^3$

[20 marks]

[*20 markah*]

SOALAN TAMAT

LAMPIRAN FORMULA (CC502 – GEOTECHNICS 2)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Slope, α	30	6	90	120	150	180
$\frac{\Delta a}{a+\Delta a}$	0.37	0.32	0.25	0.18	0.10	0

STRIP FOUNDATION

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

CIRCLE FOUNDATION

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

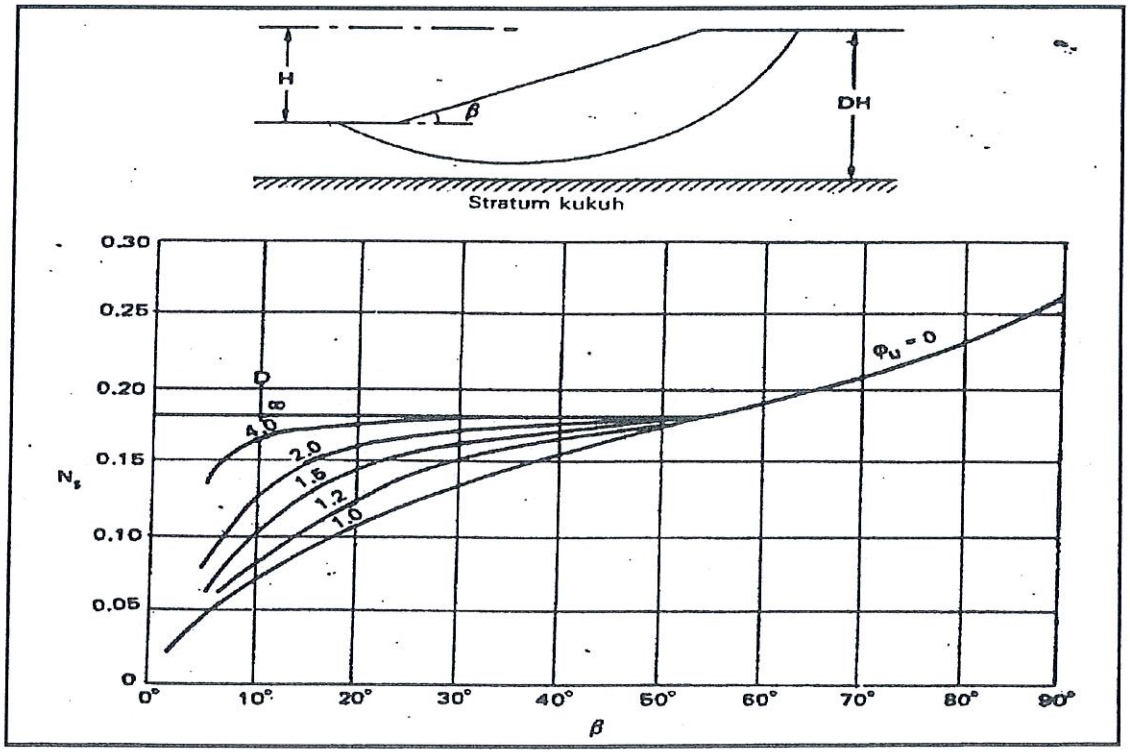
SQUARE SPREAD FOUNDATION

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

RECTANGLE SPERAD FOUNDATION

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

Taylor Stabilization Chart



BEARING 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