SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2019

DCC3103: GEOTECHNICAL ENGINEERING

TARIKH : 06 NOVEMBER 2019
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.
Bahagian A: Struktur (2 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : Kertas Graf/Formula/Taylor Stability Chart

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JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 50 MARKS
BAHAGIAN A: 50 MARKAH

INSTRUCTION:
This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **DUA (2)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO1
C1

(a) Draw rock cycle.
Lukis kitaran batuan.

[5 marks]
[*5 markah*]

CLO1
C2

(b) Describe **FIVE (5)** processes involved in a rock cycle.
*Jelaskan **LIMA (5)** proses yang terlibat dalam kitaran batuan.*

[10 marks]
[*10 markah*]

CLO1
C3

(c) The following results in **Table A1(c)** were recorded during a triaxial test on a clay soil. Determine the shear strength parameters; c and φ.
*Berikut adalah data yang telah direkodkan dalam **Jadual A1(c)** semasa ujian tiga paksi bagi tanah liat. Tentukan parameter kekuatan ricih tanah; c dan φ.*

Table A1(c) / *Jadual A1(c)*

Cell pressure, σ_3 (kN/m^2) *Tekanan sel, σ_3 (kN/m^2)*	20	80	245
Deviator stress at failure, $\Delta\sigma$ (kN/m^2) *Tegasan Sisihan, $\Delta\sigma$ (kN/m^2)*	150	160	195

[10 marks]
[*10 markah*]

QUESTION 2
SOALAN 2

CLO1 C1

(a) List **FIVE (5)** equipment in Compaction Laboratory Test.
*Senaraikan **LIMA (5)** peralatan dalam Ujian Pemadatan di makmal.*

[5 marks]
[*5 markah*]

CLO1 C2

(b) A soil sample with a mass of 48 kg and the volume is 0.026 m^3. After it has dried in an oven for 24 hours, the mass reduced to 39 kg. Given the specific gravity as 2.65. Calculate:
Satu sampel tanah dengan berat 48 kg dan isipadu sebanyak 0.026 m^3. Selepas dikeringkan di dalam oven selama 24 jam, beratnya berkurang menjadi 39 kg. Diberi nilai G_S sebanyak 2.65. Kirakan

i. Moisture content, m
Kandungan lembapan, m

[3 marks]
[*3 markah*]

ii. Dry density, ρd
Ketumpatan kering, ρd

[2 marks]
[*2 markah*]

iii. Void ratio, e
Nisbah lompang, e

[5 marks]
[*5markah*]

CLO1
C3

(c) **Table A2 (c)** shows the laboratory Standard Compaction test results on a clayey soil. Determine the dry density and optimum moisture content based on the curve compaction graph.

Jadual A2(c) *menunjukkan keputusan ujian pemadatan piawai ke atas tanah liat. Tentukan ketumpatan kering maksimum dan kandungan lembapan optimum berdasarkan graf lengkung pemadatan.*

Table A2(c) / *Jadual A2(c)*

Test number ***No Ujian***	**1**	**2**	**3**	**4**	**5**	**6**
Moisture content (%) *Kandungan lembapan*	8.4	10.6	12.9	14.4	16.6	18.6
Bulk density (Mg/m^3) *Ketumpatan pukal*	1.84	2.00	2.10	2.12	2.09	2.05

[10 marks]
[*10 markah*]

SECTION B: 50 MARKS
BAHAGIAN B: 50 MARKAH

INSTRUCTION:
This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1
SOALAN 1

CLO2
C3

(a) **Figure B1(a)** shows the soil condition and the various unit weight for each soil type. Calculate the total stress, pore water pressure and effective stress at point A for the following condition:

Rajah B1(a) *menunjukkan tanah yang mempunyai pelbagai nilai berat unit untuk setiap lapisan tanah. Kira tegasan normal, tekanan air liang dan tekanan berkesan pada titik A mengikut keadaan berikut:*

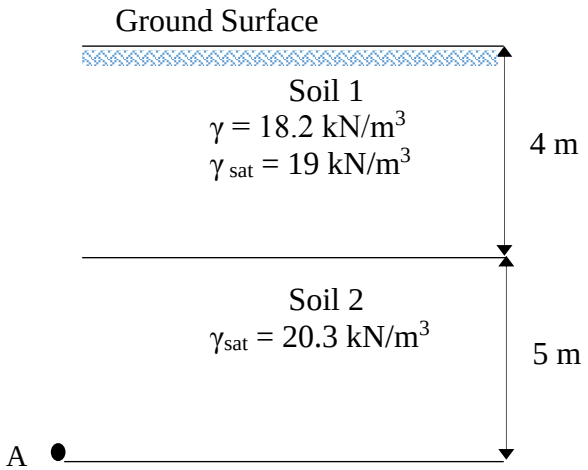

Figure B1(a) / ***Rajah B1(a)***

i. The groundwater table is 2 m below ground surface
Aras air berada 2 m bawah permukaan bumi

[5 marks]
[*5 markah*]

ii. The groundwater table is at the top of Soil 2.
Aras air berada di lapisan atas Soil 2

[5 marks]
[*5 markah*]

CLO2
C4

(b) From the soil profile shown in **Figure B1(b)** below:
*Dari profil tanah yang ditunjukkan dalam **Rajah B1(b)** dibawah:*

i. Calculate the total stress, pore water pressure and effective stress at point A, B, C and D.
Kirakan tegasan normal, tekanan air liang dan tekanan berkesan pada titik A, B, C dan D.

[10 marks]
[*10 markah*]

ii. Draw the distribution diagram for the total stress, pore water pressure and effective stress of each layer.
Lukiskan gambarajah taburan untuk tegasan normal, tekanan air liang dan tegasan berkesan bagi setiap lapisan

[5 marks]
[*5 markah*]

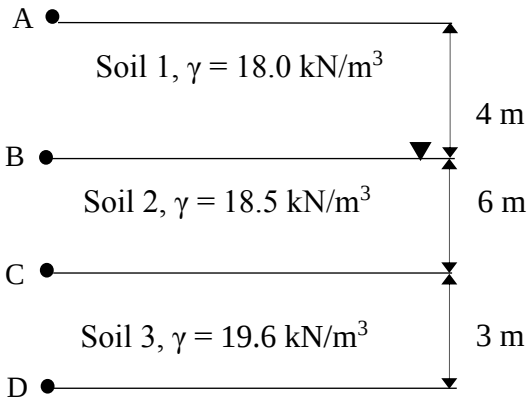

Figure B1(b) / *Rajah B1(b)*

QUESTION 2
SOALAN 2

CLO2 C3

(a) Based on **Figure B2(a)**, determine the total active thrust of gravity wall below.
*Berdasarkan **Rajah B2(a)**, tentukan jumlah tujah aktif bagi tembok graviti di bawah.*

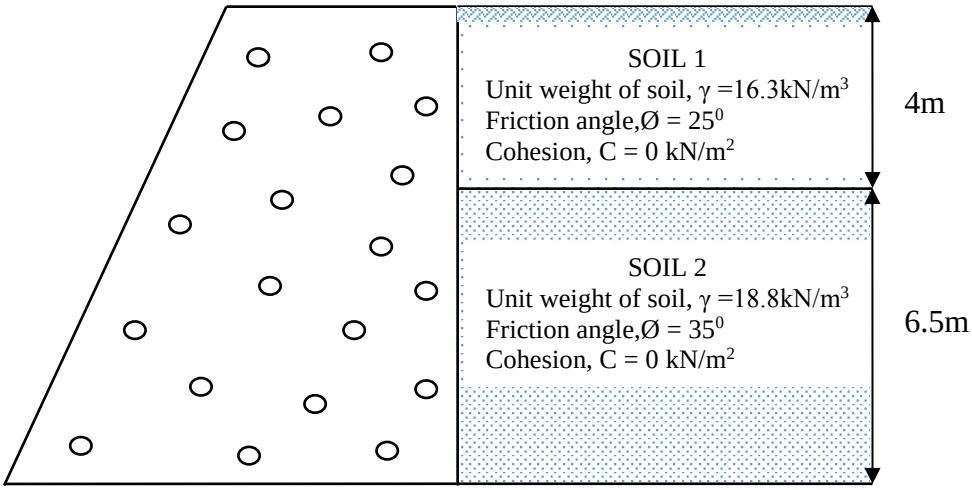

Figure B2(a) / *Rajah B2(a)*

[10 marks]
[*10 markah*]

CLO2 C4

(b) **Figure B2(b)** shows a retaining wall. Calculate the factor of safety against sliding.

Given:

Unit weight of soil, γ_{soil} =18kN/m^3

Unit weight of concrete, $\gamma_{concrete}$ =24kN/m^3

Friction angle,Ø = 30^0

Cohesion, c = 0 kN/m^2

μ = 0.45

Rajah B2(b) *menunjukkan satu tembok penahan. Kira faktor keselamatan terhadap gelongsor.*

Diberi:

Berat Unit Tanah, $\gamma_{tanah} = 18kN/m^3$

Berat Unit Konkrit, $\gamma_{konkrit} = 24kN/m^3$

Sudut Geseran, $\emptyset = 30^0$

Kejelekitan, $c = 0\ kN/m^2$

$\mu = 0.45$

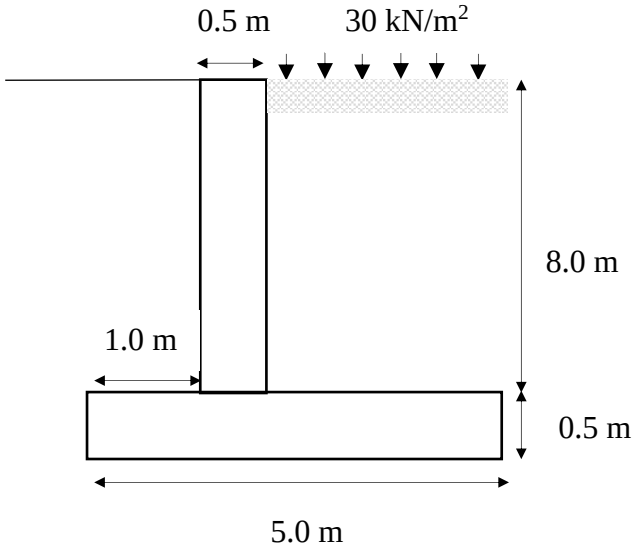

Figure B2(b) / ***Rajah B2(b)***

[15 marks]
[*15 markah*]

QUESTION 3
SOALAN 3

CLO2
C3

(a) **Figure B3(a)** below shows one dig of sheet piling on sandy soil. If the coefficient of permeability (*k*) is 7.2 x 10^{-3} mm/sec, determine the quantity of seepage, Q in m^3/hour/m length.

Rajah B3(a) *menunjukkan satu korekan cerucuk keping pada lapisan tanah pasir. Jika diberi pekali kebolehtelapan (k) tanah adalah 7.2 x 10^{-3} mm/s, tentukan Kadaralir resipan, Q dalam unit m^3/jam/m panjang.*

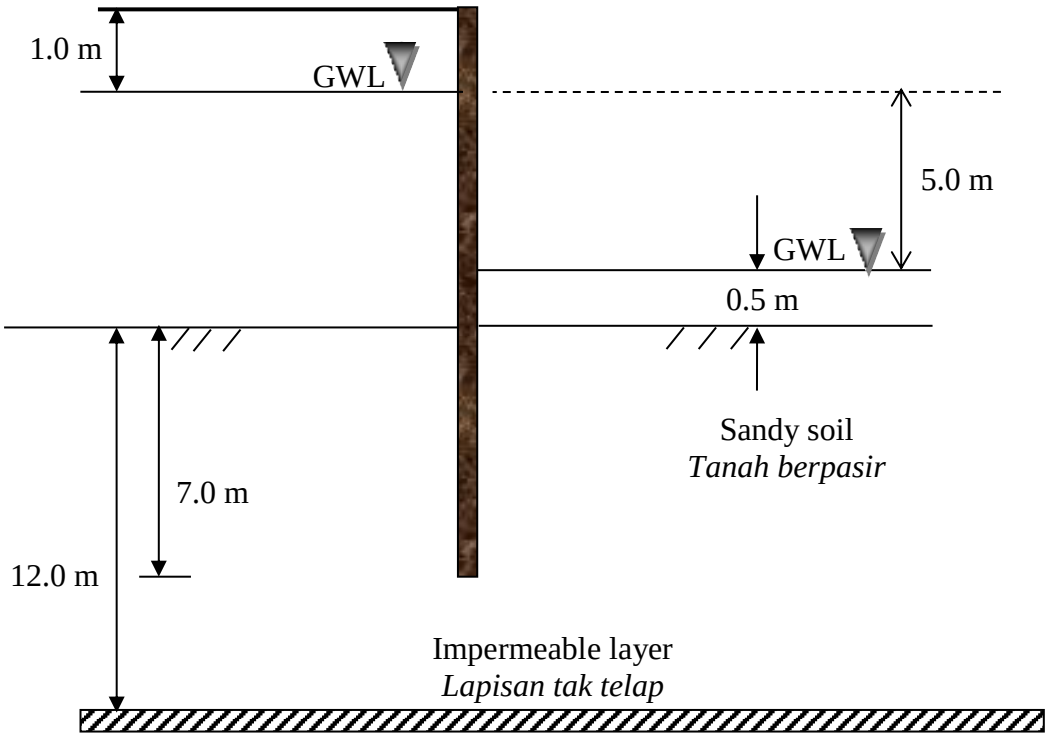

Figure B3(a) / ***Rajah B3(a)***

[10 marks]
[*10 markah*]

CLO2
C4

(b) **Figure B3(b)** below shows a draft of earth dam. The coefficient of permeability of the soil is $4.5x10^{-2}$ cm/s. Determine the pore water pressure at point A.

Rajah B3(b) *di bawah menunjukkan keratan bagi empangan tanah. Pekali kebolehtelapan tanah ialah* $4.5x10^{-2}$ *cm/s. Tentukan tekanan air liang di titik A.*

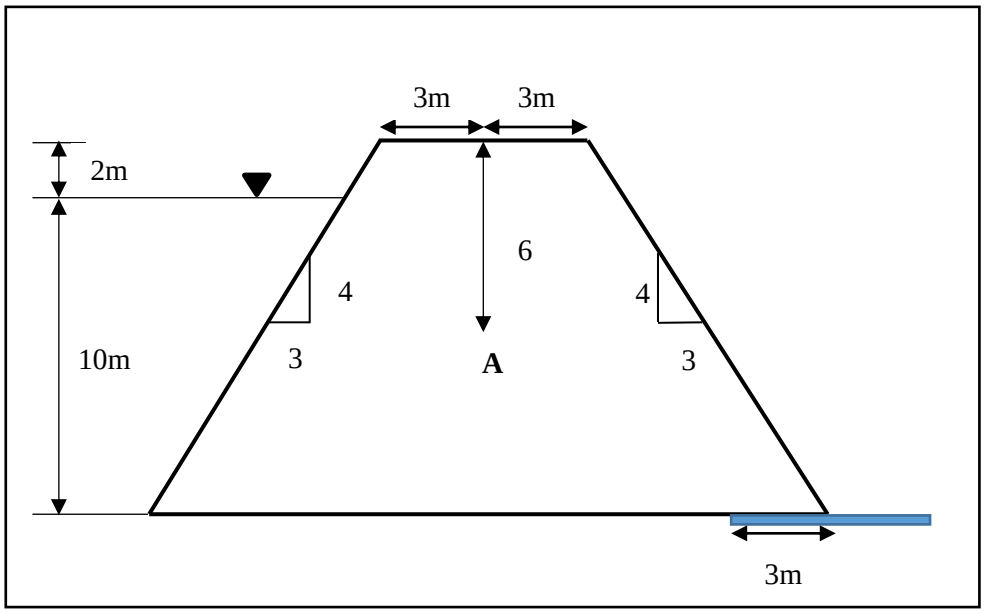

Figure B3(b) / ***Rajah*** **B3(b)**

[15 marks]
[*15 markah*]

CLO2
C3

QUESTION 4
SOALAN 4

(a) A cutting of slope in a cohesive soil form a slope angle 35^0 and height of 8m. Given undrained cohesion,c_u is 40kN/m^2 and unit weight,γ = 18kN/m^3. With the use of Taylor Stability Charts, calculate the factor of safety for:
Satu keratan cerun bagi tanah liat tepu membentuk sudut 35^0 dan ketinggian 8m. Diberi kekuatan ricih tidak bersalir, c_u 40kN/m^2 dan berat unit tanah γ = 18kN/m^3. Dengan menggunakan kaedah kestabilan Taylor, kira faktor keselamatan untuk:

i. A hard stratum exists well below the slope.
Lapisan keras berada jauh di bawah cerun

[5 marks]
[*5 markah*]

ii. A hard stratum exists at 4m below the toe of the slope.
Lapisan keras berada 4m dibawah kaki cerun

[5 marks]
[*5 markah*]

CLO2
C4

(b) Based on **Figure B4(b)** and **Table B4(b)** below, determine the factor of safety for the slope by using Fellenius slices method.
*Berdasarkan **Rajah B4(b)** dan **Jadual B4(b)** di bawah, tentukan faktor keselamatan cerun dengan menggunakan kaedah hirisan Fellenius.*

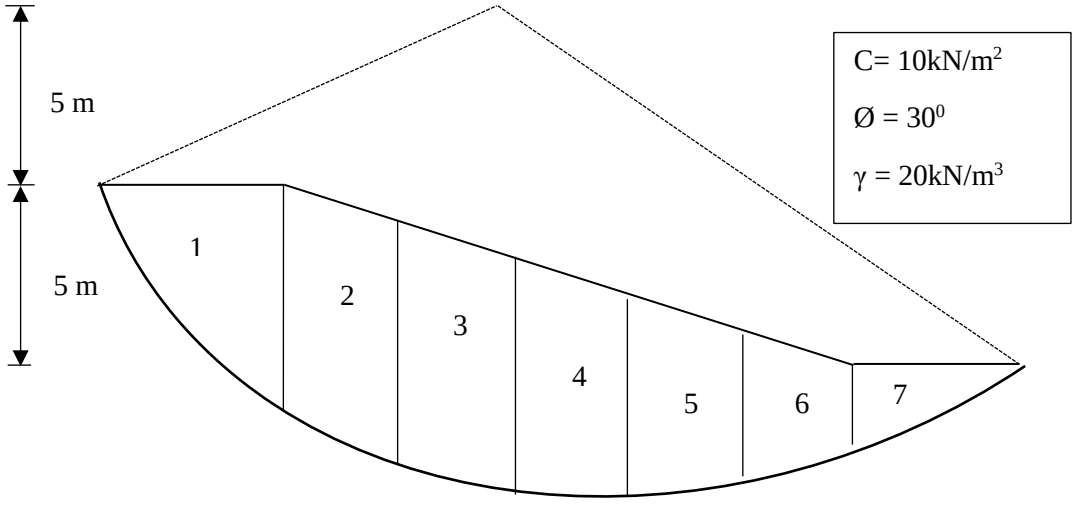

Figure B4(b) / ***Rajah B4(b)***

Table B4(b) / *Jadual 4(b)*

Slices	b (m)	α^0	z (m)
1	2.0	51	1.65
2	2.0	36	3.65
3	1.3	28	4.15
4	0.7	24	3.90
5	2.0	15	3.50
6	2.0	2	2.50
7	2.0	-5	1.20

[15 marks]
[*15 markah*]

SOALAN TAMAT

LAMPIRAN FORMULA (DCC3103 – GEOTECHNICAL ENGINEERING)

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

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

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

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

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

$$\rho_b = \frac{M_T}{V_T}$$

$$PI = LL - PL$$

$$LI = \frac{w - PL}{PI}$$

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

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

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

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

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

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

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

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

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

$$Q = kH\frac{N_f}{N_e}$$

$$u_x = \gamma_w\,[h_x - (-Z_x)]$$

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

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

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

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

$$G_s = \frac{M_s}{V_s\rho_w}$$

$$\rho_d = \frac{\rho_b}{1+w}$$

$$e = \frac{n}{1-n}$$

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

Taylor Stabilization Chart