SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI II : 2024/2025

DCC30093 : GEOTECHNICAL ENGINEERING

TARIKH : 20 MEI 2025
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Bahagian A: Subjektif (2 soalan)
Bahagian B: Subjektif (4 soalan)

Dokumen sokongan yang disertakan : Formula & Kertas Graf

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)** subjective questions. Answer **ALL** questions.

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

QUESTION 1
SOALAN 1

CLO1 (a) There are three types of rock, which are igneous, sedimentary and metamorphic. Explain any **TWO (2)** types of rocks mentioned.
*Terdapat tiga jenis batuan iaitu igneus, endapan dan metamorfisis. Terangkan mana-mana **DUA (2)** daripada batuan-batuan tersebut.*

[4 marks]
[*4 markah*]

CLO1 (b) There are three types of soil, which are residual soil, transported soil and organic soil. Explain any **TWO (2)** types of soil mentioned.
*Terdapat tiga jenis tanah, iaitu tanah baki, tanah terangkut, dan tanah organik. Terangkan mana-mana **DUA (2)** jenis tanah yang dinyatakan.*

[9 marks]
[*9 markah*]

CLO1 (c) Site Investigation is an essential work process in the construction of roads and buildings. Identify **FOUR (4)** stages involved in site investigation.
*Penyiasatan tapak adalah satu proses kerja yang penting dalam pembinaan struktur jalan dan bangunan. Kenal pasti **EMPAT (4)** peringkat yang terlibat dalam penyiasatan tapak.*

[12 marks]
[*12 markah*]

QUESTION 2
SOALAN 2

CLO1 (a) Soil compaction needs to be carried out according to good engineering practices. Identify **FOUR (4)** main purposes of soil compaction.
*Pemadatan tanah mesti dilakukan mengikut amalan kejuruteraan yang baik. Kenal pasti **EMPAT (4)** tujuan utama pemadatan tanah.*

[4 marks]
[*4 markah*]

CLO1 (b) The failure of soil criteria can be categorized into three types based on its strength characteristics. Describe **THREE (3)** characteristics of the strength of the soil.
*Kegagalan kriteria tanah boleh dibahagikan kepada tiga jenis mengikut ciri kekuatanya. Huraikan **TIGA (3)** ciri kekuatan tanah tersebut.*

[9 marks]
[*9 markah*]

CLO1 (c) Different types of shallow foundations are used depending on the specific requirement of the situation. By using a diagram, explain **FOUR (4)** reasons why the raft foundation is necessary.
*Terdapat beberapa jenis asas cetek yang digunakan berdasarkan situasi keperluan. Dengan bantuan gambar rajah, terangkan **EMPAT (4)** sebab kenapa asas rakit diperlukan.*

[12 marks]
[*12 markah*]

SECTION B : 50 MARKS

BAHAGIAN B : 50 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** subjective questions. Answer **TWO (2)** questions only.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1

SOALAN 1

CLO2 (a) The results of a sieve analysis on a soil sample are shown in Table B1(a).
Keputusan analisis ayakan ke sampel tanah ditunjukkan dalam Jadual B1(a).

Table B1(a) / *Jadual B1(a)*

Sieve size (mm) *Saiz Ayakan (mm)*	Mass retained (g) *Jisim Tertahan (g)*
10	0.0
6.3	5.5
2	25.7
1	23.1
0.6	22.0
0.3	17.3
0.15	12.7
0.063	6.9

2.3g of the soil sample passed through the 63µm sieve. Determine the values of coefficient of curvature (Cc) and coefficient of uniformity (Cu) for the sample.
2.3g sampel tanah tersebut melepasi ayak 63µm. Tentukan nilai pekali kelengkungan (Cc) dan pekali keseragaman (Cu) sampel tanah tersebut.

[10 marks]
[*10 markah*]

CLO2 (b) A standard proctor compaction test is conducted on a soil sample. The result is shown in Table B1(b) below:
Satu ujikaji pemadatan proktor piawai telah dijalankan ke atas satu sampel tanah. Keputusan ujikaji ditunjukkan pada Jadual B1(b) di bawah:

Table B1(b) / *Jadual B1(b)*

Moisture Content (%) *Kandungan Lembapan (%)*	4.2	5.4	7.8	9.2	12.0
Bulk Unit Weight, γ_b (kN/m^3) *Berat Unit Pukal, γ_b (kN/m^3)*	17.61	19.02	21.13	21.29	20.72

Based on data in Table B1(b), calculate maximum dry unit weight and optimum moisture content from dry unit weight against moisture content graph.
Berdasarkan kepada data di dalam Jadual B1(b), kirakan ketumpatan kering maksimum dan kandungan lembapan optimum daripada graf ketumpatan kering melawan kandungan lembapan.

[15 marks]
[*15 markah*]

QUESTION 2

SOALAN 2

CLO2 (a) A direct shear test is conducted on compacted sand soil samples. The size of a sample was 6cm x 6cm. The result is shown in Table B2(a).

Satu ujian ricih terus dijalankan ke atas sampel-sampel tanah pasir yang dipadatkan. Saiz setiap sampel adalah 6cm x 6cm. Keputusan seperti ditunjukkan dalam Jadual B2(a).

Table B2(a) / *Jadual B2(a)*

Samples / *Sampel*	S1	S2	S3
Normal load at failure, N (kN) *Beban normal semasa gagal, N (kN)*	0.2	0.4	0.6
Shear stress at failure, t_f (kN/m^2) *Tegasan ricih semasa gagal, t_f (kN/m^2)*	78	111	147

Determine the parameters of shear strength for these soil samples.

Tentukan parameter-parameter kekuatan ricih sampel tanah tersebut.

[10 marks]

[10 *markah*]

CLO2 (b) The result of Three Axial Flow Series Test for a soil sample is shown in Table B2(b). Calculate the value of cohesion, (c) and angle of friction, (ϕ) for the soil.

Keputusan Ujian Tiga Paksi untuk sampel tanah adalah seperti Jadual B2(b). Kirakan nilai kejelekitan, (c) dan sudut geseran, (ϕ) untuk tanah tersebut.

Table B2(b) / *Jadual B2(b)*

Samples / *Sampel*	A	B	C	D
Minor normal stress, [σ_3'] (kN/m^2) *Tegasan normal minor, [σ_3'] (kN/m^2)*	100	200	350	500
Deviator stress,[σ_1' – σ_3'] (kN/m^2) *Tegasan sisih, [σ_1' – σ_3'] (kN/m^2)*	286	374	513	652

[15 marks]

[*15 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) A clay stratum with 8m thick is located at a depth of 6m below the ground surface. The void ratio of the clay is 1.54 and Gs = 2.75. The soil stratum between the ground surface and the clay consists of fine sand. The water table is located at a depth of 2m below the ground surface. The submerged unit weight of fine sand is 10.5 kN/m^3 and the moisture unit weight above the water table is 18.68 kN/m^3. Calculate the total stress, pore water pressure and effective stress at the center of the clay layer.

Satu lapisan tanah liat setebal 8m terletak pada kedalaman 6m dari permukaan tanah. Nisbah lompang tanah liat adalah 1.54 dan Gs = 2.75. Lapisan tanah antara permukaan tanah dan tanah liat terdiri daripada pasir halus. Paras air terletak pada kedalaman 2m di bawah permukaan tanah. berat unit pasir halus yang tenggelam adalah 10.5 kN/m^3 dan berat unit kelembapan di atas aras air adalah 18.68 kN/m^3. Kirakan tegasan jumlah, tekanan air liang dan tegasan berkesan di tengah lapisan tanah liat.

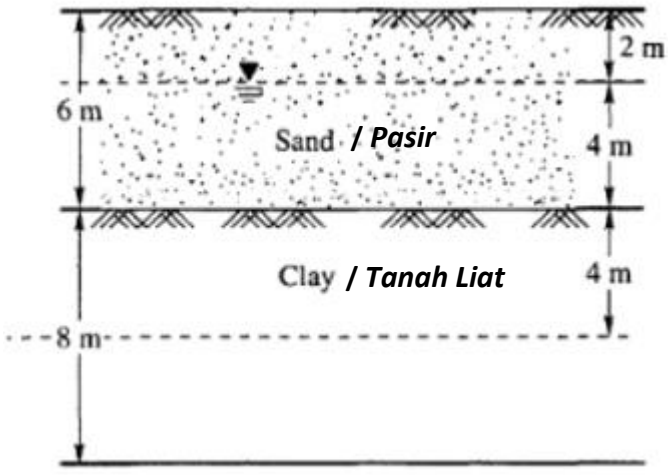

Figure B3(a) / *Rajah B3(a)*

[10 marks]

[*10 markah*]

CLO2

(b) Figure B3(b) shows a 3m high retaining wall. By using the Rankine theory, calculate the magnitude and position of active thrust that acts behind the wall.
Rajah B3(b) menunjukkan dinding penahan setinggi 3m. Dengan menggunakan teori Rankine, kirakan magnitud dan kedudukan daya aktif yang bertindak di belakang dinding.

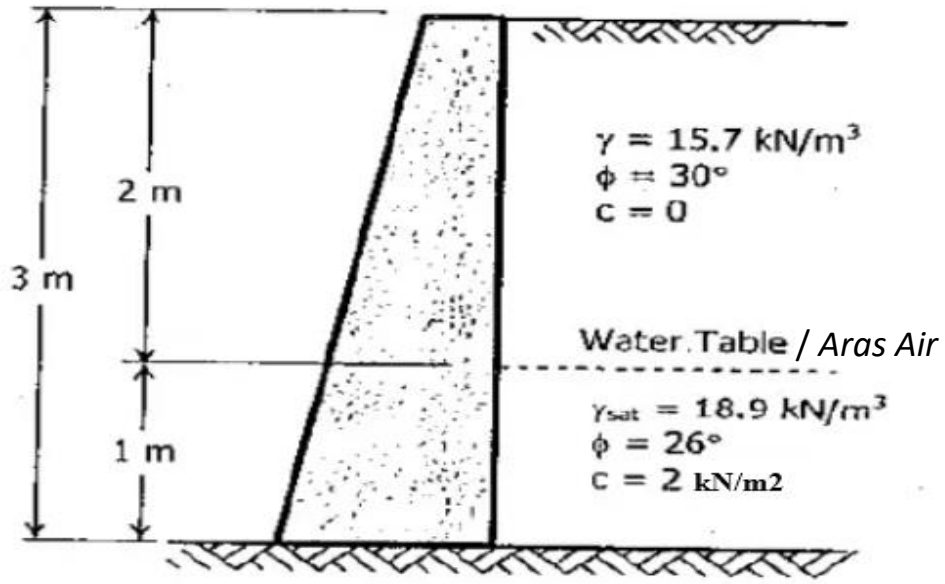

Figure B3(b) / *Rajah B3(b)*

[15 marks]
[*15 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Figure B4(a) shows one dig of sheet pile on a sandy soil. If the coefficient of permeability, k = 0.02 mm/sec, calculate the quantity of seepage, Q in m^3/day/m length.

Rajah B4(a) menunjukkan satu korekan cerucuk keping pada lapisan tanah pasir. Jika diberi pekali kebolehtelapan, k tanah adalah 0.02 mm/saat, kirakan kadaralir resipan, Q dalam unit m^3/hari/m panjang.

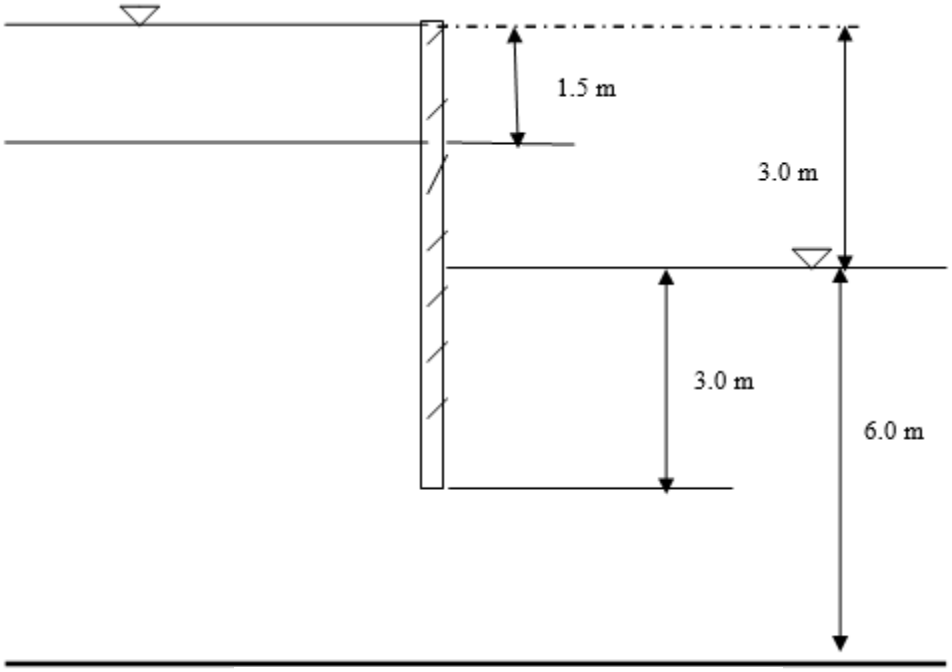

Figure B4(a) / *Rajah B4(a)*

[10 marks]

[*10 markah*]

CLO2 (b) Referring to Figure B4(b) and Table B4(b), evaluate the safety of the slope by using Fellenius method

Merujuk kepada Rajah B4(b) dan Jadual B4(b), nilaikan faktor keselamatan bagi cerun dengan menggunakan kaedah hirisan Fellenius.

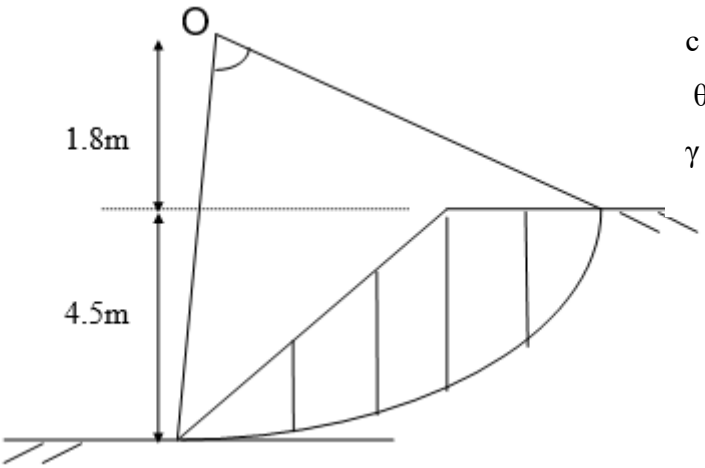

Figure B4(b) / *Rajah B4(b)*

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

Slice / *Hirisan*	α	z (m)	b (m)
1	-25	1.8	3
2	8.5	3.7	3
3	11	4.6	3
4	30	5.2	3
5	52	2.5	3

[15 marks]

[*15 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC30093 GEOTECHNICAL ENGINEERING

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

$$\rho_b = \frac{G_s \rho_w (1+w)}{1+e}$$

$$\rho_b = \frac{M_s (1+w)}{V}$$

$$\rho_d = \frac{G_s \rho_w}{1+e}$$

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

$$S = \frac{w G_s}{e}$$

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

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

$$PI = LL - PL$$

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

$$N_q = e^{\pi \tan \emptyset} \tan^2(45 + \phi / 2)$$

$$N_c = \left(N_q - 1\right) kot\, \phi$$

$$N_\gamma = 2.0(Nq + 1) \tan \phi$$

$$q_u = CuN_C + \gamma D N_q + 0.5 \gamma B N_\gamma$$

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

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

$$\sigma_v = \rho g h = \gamma h$$

$$u = \gamma_\omega h$$

$$\sigma_v = \sigma_v' + u$$

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

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

$$\sigma_a = k_a \gamma z$$

$$\sigma_a = 2C\sqrt{K} a$$

$$P = \frac{R_v}{B}\left[1 \pm \frac{6e}{B}\right]$$

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

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

$$FOS = \frac{uR}{uT}$$

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

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

$$FOS = \frac{\sum CL' + W\cos\alpha\tan\emptyset}{\sum W\sin\alpha}$$

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

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

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

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

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

$$Ux = \gamma_w[h_x - (-z_x)]$$

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

α	30	60	90	120	150	180
$\frac{\Delta a}{a + \Delta a}$	0.37	0.32	0.25	0.18	0.1	0