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 I : 2023/2024

DCC30093 : GEOTECHNICAL ENGINEERING

TARIKH : 19 DISEMBER 2023
MASA : 08.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.
Bahagian A: Struktur (2 soalan)
Bahagian B: Esei (4 soalan)

Dokumen sokongan yang disertakan Formula

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) Identify the purpose of soil mechanic in the Civil Engineering field.
Kenal pasti tujuan mekanik tanah dalam bidang Kejuruteraan Awam.

[4 marks]
[*4 markah*]

CLO1 (b) With the aid of rock cycle diagram, explain types of rocks in Malaysia.
Dengan bantuan diagram kitaran batuan, terangkan jenis-jenis batuan di Malaysia.

[9 marks]
[*9 markah*]

CLO1 (c) Soil investigation is the process of a thorough investigation of the geological and soil conditions below the surface by means of surface surveys 'trial pits', bore holes and others. Determine **FIVE (5)** criteria (uses, operating procedure, precautionary, errors and limitation) in-situ soil testing using the Mackintosh Probe.
*Penyiasatan tanah ialah proses penyiasatan menyeluruh tentang keadaan geologi dan tanah di bawah permukaan dengan cara tinjauan permukaan lubang ujian, lubang gerudi dan lain-lain. Tentukan **LIMA (5)** kriteria (kegunaan, prosedur operasi, langkah berjaga-jaga, ralat dan had) ujian tanah in-situ menggunakan Probe Mackintosh.*

[12 marks]
[*12 markah*]

QUESTION 2
SOALAN 2

CLO1 (a) Soils can be of either two-phase or three-phase composition. With the aid of diagram, describe the three-phase composition of soils.
Tanah boleh terdiri daripada komposisi dua fasa atau tiga fasa. Dengan bantuan diagram, huraikan komposisi tanah dalam keadaan tiga fasa.

[4 marks]
[*4 markah*]

CLO1 (b) Soil generally fails in shear. Relate the shear failure plane and the parameter of shear strength (c & φ) by drawing the Mohr circle.
Tanah pada amnya gagal ricih. Hubungkaitkan satah kegagalan ricih dan parameter kekuatan ricih (c & φ) dengan melukis bulatan Mohr.

[9 marks]
[*9 markah*]

CLO1 (c) Explain the shallow foundation based on the definition and its **FIVE (5)** criteria (depth of the foundation, cost, feasibility, mechanism of load transfer and types of foundation).
*Terangkan mengenai asas cetek berdasarkan definisi dan **LIMA (5)** kriteria asas tersebut (kedalaman asas, kos, kebolehlaksanaan, mekanisma agihan beban, dan jenis-jenis asas).*

[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) Determine the dry and bulk density of a soil sample having a porosity of 0.32 and a moisture content of 25% (Gs = 2.70).

Tentukan ketumpatan kering dan pukal bagi sampel tanah yang mempunyai keliangan 0.32 dan kandungan lembapan 25% (Gs = 2.70).

[10 marks]

[*10 markah*]

CLO2 (b) The results of a standard proctor compaction test, which has been performed on a soil sample are given in Table B1(a). Using a suitable graph, specify the maximum dry density ($\rho_{d\ max}$) and optimum moisture content (m_{opt}) of the soil.

Keputusan ujian pemadatan proktor piawai, yang telah dilakukan ke atas sampel tanah ditunjukkan dalam Jadual B1(a). Menggunakan graf yang sesuai, nyatakan ketumpatan kering maksimum ($\rho_{d\ maks}$) dan kandungan lembapan optimum (m_{opt}) tanah.

Table B1(a)/Jadual B1(a)

Mass of wet soil in mould (kg) / *Jisim tanah basah beserta acuan (kg)*	Moisture Content (%) / *Kandungan Lembapan (%)*	Bulk Density (kg/m^3) / *Ketumpatan pukal (kg/m^3)*
1.47	10	1558.4
1.83	12.5	1940.0
2.02	15	2141.4
1.95	17.5	2067.2
1.73	20	1834.0
1.69	22.5	1791.6

Volume of mould / *Isipadu acuan* = 943.3 cm^3

[15 marks]

[*15 markah*]

QUESTION 2
SOALAN 2

CLO2 (a) Table B2(a) shows the results of four drained direct shear tests on undisturbed normally consolidated clay samples having a diameter of 50mm and height of 25mm. Calculate normal stress, σ_n and shear stress at failure, τ_f.

Jadual B2(a) menunjukkan keputusan bagi empat ujian ricih terus yang disalirkan ke atas sampel tanah liat tidak terganggu yang mempunyai diameter 50 mm dan ketinggian 25 mm. Kirakan tegasan normal, σ_n dan tegasan ricih pada kegagalan, τ_f.

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

Test no. / *No. ujian*	Normal force (N) / *Daya normal (N)*	Shear force at failure (N) / *Daya ricih pada masa gagal (N)*
1	67	23.3
2	133	46.6
3	213	73.5
4	369	132.3

[10 marks]
[*10 markah*]

CLO2 (b) Table B2(b) shows data from a series of consolidated drained (CD) triaxial test.
Jadual B2(b) menunjukkan data dari ujian tiga paksi terkukuh-tersalir (CD).

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

Test / *Ujian*	1	2	3
Cell pressure (kPa) / *Tekanan Sel (kPa),* σ_3	150	300	500
Deviator stress at failure (kPa) / *Tekanan Deviator pada masa gagal*, σ_d	192	385	638

Using a shear stress versus normal stress graph, specify the value of the shear strength parameters (c and ϕ).
Menggunakan graf tegasan ricih melawan tegasan normal, nyatakan parameter kekuatan ricih (c and ϕ).

[15 marks]
[*15 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) A soil profile is shown in Figure B3(a). Calculate the total stress, pore water pressure and effective stress at points A, B and C.

Profil tanah ditunjukkan dalam Rajah B3(a). Kirakan jumlah tegasan, tekanan air liang dan tegasan berkesan pada titik A, B dan C.

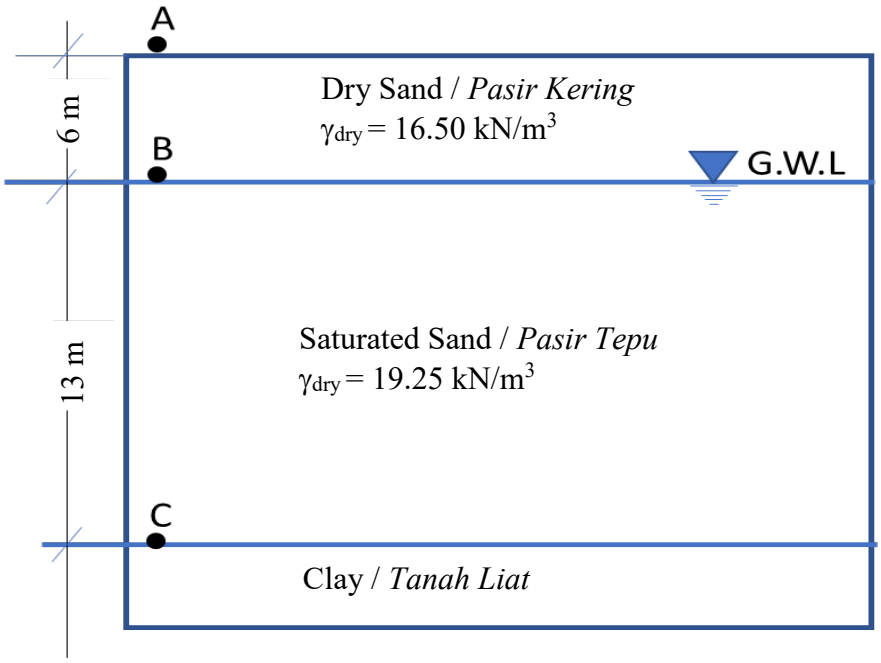

Figure B3(a) / *Rajah B3(a)*

[10 marks]

[*10 markah*]

CLO2

(b) Figure B3(b) below, shows an 8m high retaining wall. Using the Rankine theory, calculate the magnitude and position of active thrust that acts behind the wall.

Rajah B3(b) di bawah, menunjukkan sebuah tembok penahan setinggi 8m. Menggunakan teori Rankine, kirakan magnitud dan kedudukan tujahan aktif yang bertindak di belakang dinding.

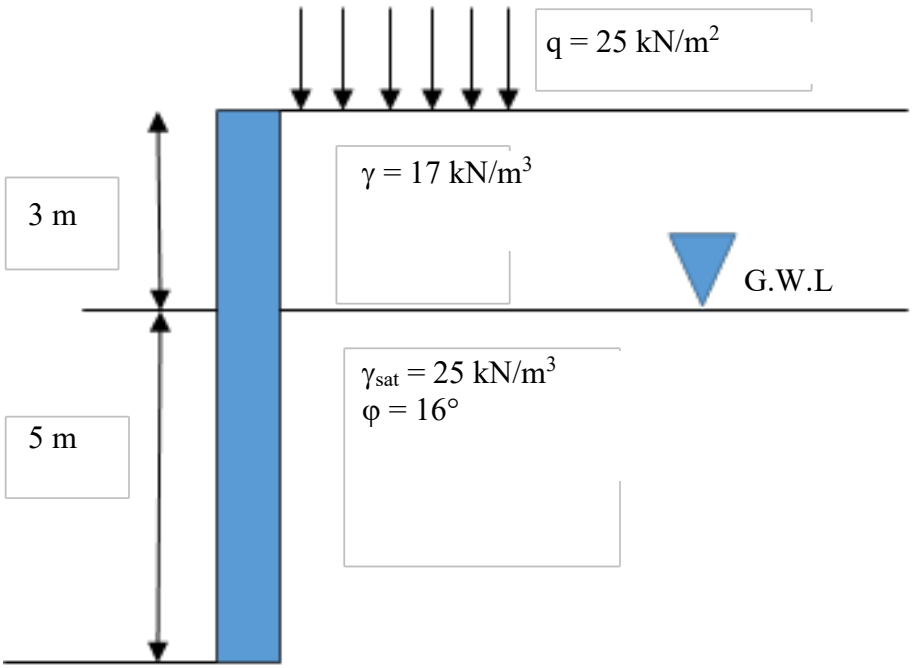

Figure B3(b) / *Rajah B3(b)*

[15 marks]

[*15 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Construct the flow net for earth dam on impermeable soil as shown in Figure B4(a). Scale 1:5 is recommended.

Bina jaring aliran untuk empangan tanah di atas tanah tak telap seperti yang ditunjukkan dalam Rajah B4(a). Skala 1:5 adalah disyorkan.

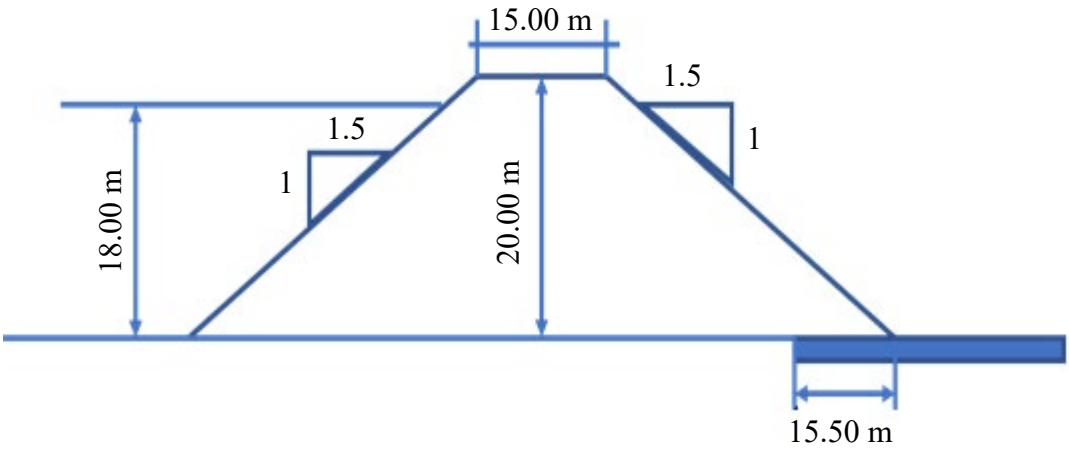

Figure B4(a) / *Rajah B4(a)*

[10 marks]

[*10 markah*]

CLO2

(b) Refer to Figure B4(b) and Table B4(b) below, evaluate the factor of safety for the slope by using the method of slices by Fellenius. Given the width for every slice is 4m.

Merujuk kepada Rajah B4(b) dan Jadual B4(b) di bawah, nilaikan faktor keselamatan bagi cerun dengan menggunakan kaedah hirisan Fellenius. Diberi lebar bagi setiap hirisan ialah 4m.

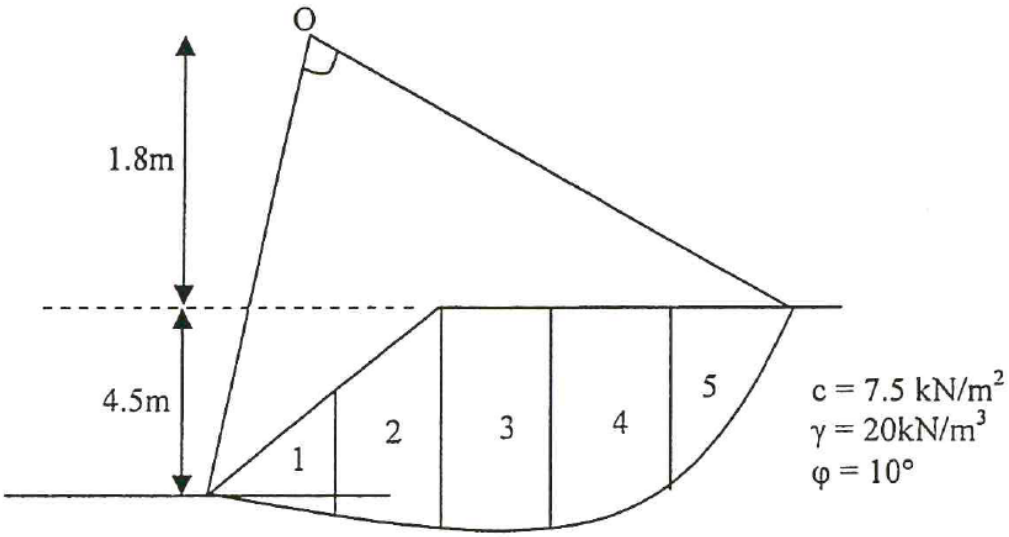

Figure B4(b) / Rajah B4(b)

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

Slices/*Hirisan*	α°	Z (m)
1	-5	2,8
2	3	4.7
3	16	5.6
4	23	4.9
5	38	3.5

[15 marks]

[*15 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC30093 GEOTECHNICAL ENGINEERING

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

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

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

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

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

$$S = \frac{wG_s}{e}$$

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

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

$$PI = LL - PL$$

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

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

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

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

$$q_u = CuN_C + \gamma DN_q + 0.5\gamma BN_\gamma$$

$$q_u = 1.3CuN_C + \gamma DN_q + 0.4\gamma BN_\gamma$$

$$q_u = 1.3CuN_C + \gamma DN_q + 0.3\gamma BN_\gamma$$

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

$$u = \gamma_\omega h$$

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

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

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

$$\sigma_a = k_a \gamma z$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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