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 : 2023/2024

DCC30093: GEOTECHNICAL ENGINEERING

TARIKH : 10 JUN 2024
MASA : 2.30 PETANG – 4.30 PETANG (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** 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) Weathering is the conversion, decomposition or disintegration of intact mass of rocks to smaller pieces. Describe **TWO (2)** types of weathering process of rocks.
*Luluhawa ialah penukaran, penguraian atau peleraian jisim batuan kepada kepingan yang lebih kecil. Huraikan **DUA (2)** jenis proses luluhawa batuan.*
[4 marks]
[*4 markah*]

CLO1 (b) Compare **FIVE (5)** differences between residual soil and transported soil.
*Bandingkan **LIMA (5)** perbezaan di antara tanah baki dan tanah angkut.*
[9 marks]
[*9 markah*]

CLO1 (c) Site investigation is an important part of any construction project. Explain **FOUR (4)** objectives of site investigation.
*Penyiasatan tapak adalah merupakan bahagian penting dalam mana-mana projek pembinaan. Terangkan **EMPAT (4)** objektif penyiasatan tapak.*
[12 marks]
[*12 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) The plastic limit and liquid limit are terms used in soil mechanics to characterize the consistency and behavior of fine grain soils. Explain the term of liquid limit and plastic limit.

Had plastik dan had cecair adalah istilah yang digunakan dalam mekanik tanah untuk mencirikan konsistensi dan tingkah laku tanah berbutiran halus. Jelaskan istilah had plastik dan had cecair.

[4 marks]

[*4 markah*]

CLO1 (b) The triaxial test and the shear box test are both laboratory methods used in geotechnical engineering to determine the shear strength parameters of soils. Differentiate between shear box test and triaxial test in term of loading conditions, sample shape and drainage.

Ujian tiga paksi dan ujian kotak ricih adalah kaedah makmal yang digunakan dalam kejuruteraan geoteknik untuk menentukan parameter kekuatan ricih tanah. Bezakan di antara ujian kotak ricih dan ujian tiga paksi dari segi keadaan bebanan, bentuk sampel dan saliran.

[9 marks]

[*9 markah*]

CLO1 (c) Foundation is an important component that determines the strength and stability of the entire building. Explain **FOUR (4)** factors affecting the selection of foundation for a building.

*Asas adalah merupakan komponen penting yang menentukan kekuatan dan kestabilan keseluruhan bangunan. Jelaskan **EMPAT (4)** faktor yang mempengaruhi pemilihan jenis asas bagi sesuatu bangunan.*

[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) A sample of undisturbed soil has a mass of 0.198 kg. The total volume of the soil sample is 8.264×10^{-3} m^3. After drying it in an oven for 24 hours, the mass is 0.174 kg. Calculate the moisture content (m), bulk unit weight (γ_b) and dry unit weight (γ_d) for the soil sample.

Satu sampel tanah tidak terganggu mempunya berat 0.198 kg . Isipadu tanah tersebut adalah 8.264×10^{-3} m^3. Selepas dikeringkan di dalam oven selama 24 jam, beratnya ialah 0.174 kg. Kirakan kandungan lembapan (m), berat unit pukal (γ_b) dan berat unit kering (γ_d) bagi sampel tanah tersebut.

[10 marks]

[*10 markah*]

CLO2 (b) A data of a standard proctor compaction test conducted on a soil sample is shown in the Table B1(b). With the aid of a suitable graph, specify the maximum dry density and the optimum moisture content of the soil.

Data dari ujikaji pemadatan Proctor piawai yang dijalankan ke atas suatu sampel tanah ditunjukkan didalam Jadual B1(b). Dengan bantuan graf yang sesuai, tentukan nilai ketumpatan kering maksimum dan kelembapan optimum tanah tersebut.

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

Bulk density *Ketumpatan Pukal* (kg/m^3)	1998	2112	2218	2189	2146
Moisture Content *Kandungan lembapan* (%)	8	10	12	14	16

[15 marks]

[*15 markah*]

QUESTION 2
SOALAN 2

CLO2 (a) A shear box test was conducted on a soil sample. Determine the shear strength parameter of the soil sample based on data in Table B2(a).
Satu ujian kotak ricih telah dijalankan ke atas satu sampel tanah. Tentukan parameter kekuatan ricih sampel tanah tersebut berdasarkan data di dalam Jadual B2(a).

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

Sample number *Nombor Sampel*	Normal Stress *Tegasan Normal* (kN/m^2)	Shear stress *Tegasan Ricih* (kN/m^2)
1	120	80
2	275	155
3	475	250

[10 marks]
[*10 markah*]

CLO2 (b) An undrained triaxial test was conducted on a clay soil sample. The result is shown in Table B2(b). Specify shear strength parameters c' and ø'.
Satu ujian tiga paksi tidak bersalir telah dijalankan ke atas sampel tanah liat. Keputusannya ditunjukkan dalam Jadual B2(b). Tentukan parameter kekuatan ricih c' and ø'.

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

Cell pressure / *Tekanan sel* (kN/m^2)	100	200	300
Deviator stress / *Tegasan sisihan* (kN/m^2)	170	260	360
Pore water pressure / *Tekanan air liang* (kN/m^2)	15	40	80

[15 marks]
[*15 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) A soil profile with a depth and unit weight is shown in Figure B3(a). Sketch the diagram of stress distribution based on vertical stress, pore water pressure and effective stress at the depth of 7 m.

Satu profil tanah dengan kedalaman dan berat unit ditunjukkan dalam Rajah B3(a). Lakarkan gambar rajah agihan tegasan berdasarkan nilai tegasan pugak, tekanan air liang dan tegasan berkesan tanah pada kedalaman 7 m.

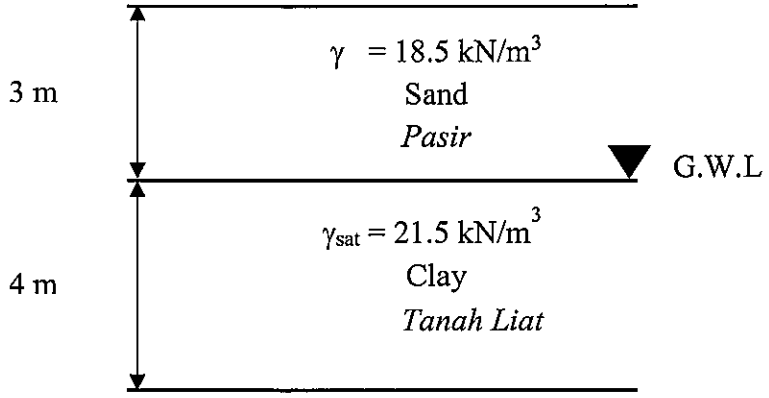

Figure B3(a) / *Rajah B3(a)*

[10 marks]

[*10 markah*]

CLO2 (b) Figure B3(b) shows a 10 m high retaining wall. Calculate the total resultant force pressure (Σ Pa) at the depth of 10 m and the location of the resultant force (Y).

Rajah B3(b) menunjukkan tembok penahan setinggi 10 m. Kirakan jumlah tekanan daya tujah (ΣPa) pada kedalaman 10 m dan lokasi daya tujah tersebut (Y).

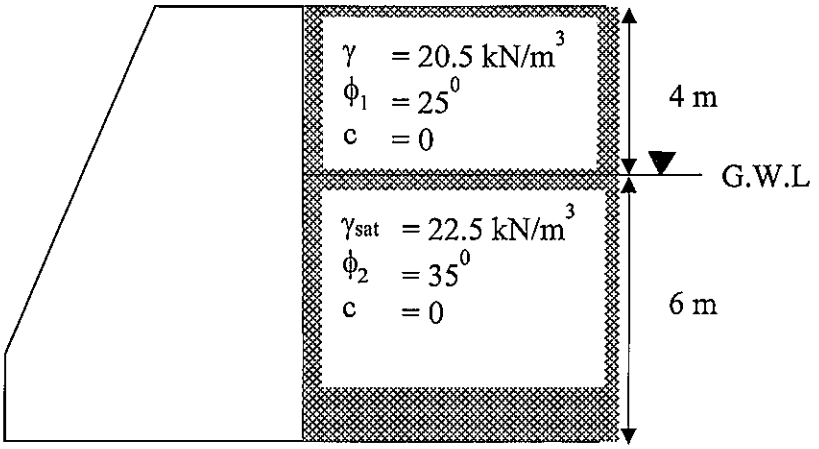

Figure B3(b) / *Rajah B3(b)*

[15 marks]

[*15 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Figure B4(a) shows a flow net of a concrete dam. Given the coefficient of permeability of the soil is $2.5x10^{-2}$ cm/s. Calculate quantity of seepage, q in m^3/hour/m length and pore water pressure at point A.

Rajah B4(a) *menunjukkan jaringan aliran bagi empangan konkrit. Diberi pekali kebolehtelapan tanah ialah* $2.5x10^{-2}$ *cm/s . Kirakan kuantiti resipan, q dalam* m^3*/jam/m panjang dan tekanan air liang pada titik A.*

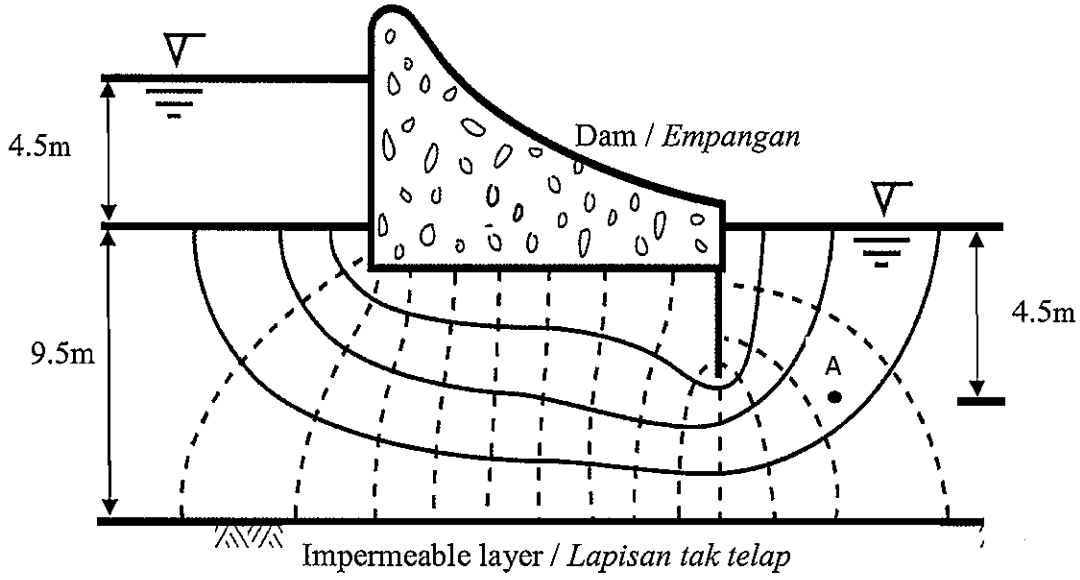

Figure B4(a) / *Rajah B4(a)*

[10 marks]

[*10 markah*]

CLO2 (b) For the Figure B4(b) and Table 4(b) below, analyse the slope factor of safety by using Fellenius slices method.

Untuk Rajah B4(b) dan Jadual B4(b) di bawah, analisis faktor keselamatan cerun dengan menggunakan kaedah hirisan Fellenius.

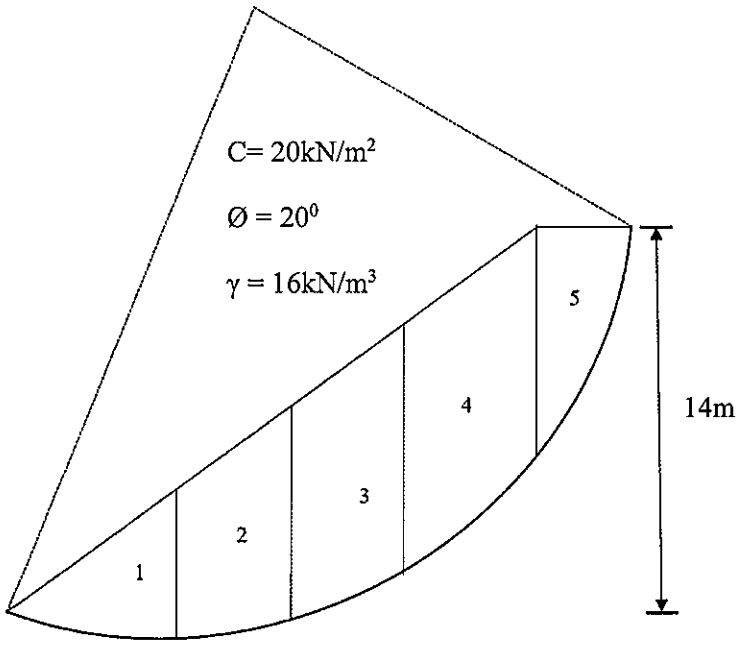

Figure B4(b) / *Rajah B4(b)*

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

Slices / *Hirisan*	b (m)	α°	z (m)
1	2.0	45	6.5
2	4.0	26	8.1
3	2.3	15	8.8
4	2.1	13	8.7
5	4.5	10	8.4

[15 marks]

[*15 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC30093 GEOTECHNICAL ENGINEERING

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

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

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

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

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

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

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

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

$$PI = LL - PL$$

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

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

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

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

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

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

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

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

$$u = \gamma_\omega h$$

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

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

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

$$\sigma_a = k_a \gamma z$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Correction Table $\frac{\Delta\alpha}{\alpha + \Delta\alpha}$ 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