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 : 2022/2023

DCC30093 : GEOTECHNICAL ENGINEERING

TARIKH : 7 JUN 2023
MASA : 8.30 PG – 10.30 PG (2 JAM)

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

Bahagian A: Subjektif (2 soalan)
Bahagian B: Subjketif (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) Describe the term of Soil and Geotechnical Engineering.
Huraikan istilah bagi Tanah dan Kejuruteraan Geoteknik.

[4 marks]
[*4 markah*]

CLO1 (b) Explain the disturbed soil and undisturbed soil.
Terangkan tanah terganggu dan tanah tidak terganggu.

[9 marks]
[*9 markah*]

CLO1 (c) Site exploration, soil sampling/laboratory testing and site investigation report are work procedures in site investigation. Explain clearly the **THREE (3)** stages mentioned.
*Penerokaan tapak, persampelan tanah/ujian makmal dan laporan penyiasatan tapak adalah prosedur kerja dalam penyiasatan tapak. Terangkan dengan jelas **TIGA (3)** peringkat yang disebutkan.*

[12 marks]
[*12 markah*]

QUESTION 2
SOALAN 2

CLO1 (a) Soil compaction must be done 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 soil criteria failure can be divided into three types according to its strength characteristics. Describe the **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) There are different types of shallow foundation used based on the situation required, with aided diagram explain why the raft foundation is required.
Terdapat beberapa jenis asas cetek yang digunakan berdasarkan situasi keperluan, dengan bantuan gambar rajah, terangkan 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 obtained from the standard compaction test at mall construction site are shown in Table B1(a). Using the dry density versus water content graph determine the value of maximum dry density and optimum moisture content of the soil.

Keputusan yang diperolehi daripada ujian pemadatan piawai di tapak pembinaan pasar raya adalah seperti Jadual B1(a). Dengan menggunakan graf ketumpatan kering melawan kandungan lembapan, tentukan nilai ketumpatan kering maksimum dan kandungan lembapan optimum bagi tanah tersebut.

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

Bulk density (kg/m^3) *Ketumpatan pukal*	2058	2125	2152	2159	2140
Moisture Content (%) *Kandungan lembapan*	12.9	14.3	15.7	16.9	17.9

[10 marks]
[*10 markah*]

CLO2

(b) A soil sample was excavated from an area near Taman Sri Serdang. A cylindrical soil sample measuring 0.102m height and 0.05m in diameter. The weight of the soil sample is 0.419kg and the weight of the soil after drying for 24 hours is 0.371kg. From the conducted test, the value of the specific gravity of the soil, Gs is 2.65. Calculate **FIVE (5)** properties (bulk density, dry density, moisture content, void ratio, and porosity) of the soil.

Suatu sampel tanah dikorek daripada satu kawasan berhampiran Taman Sri Serdang. Sampel tanah berbentuk silinder berukuran 0.102m tinggi dan garispusat 0.05m. Berat sampel tanah pula adalah 0.419kg dan berat tanah selepas dikeringkan selama 24 jam pula adalah 0.371kg. Daripada ujian yang dijalankan nilai Graviti tentu tanah, Gs adalah 2.65. Kirakan ***LIMA (5)*** *ciri asas (ketumpatan pukal, ketumpatan kering, kandungan lembapan tanah, nisbah lompang dan keliangan) tanah tersebut.*

[15 marks]

[*15 markah*]

QUESTION 2

SOALAN 2

CLO2 (a) Three identical specimens of clay having a small air void content were tested with unconsolidated undrained triaxial test and the following results were shown in Table B2(a). Determine the cohesion and angle friction of the soil.

Tiga spesimen tanah liat yang sama yang mempunyai kandungan nisbah lompang yang kecil telah diuji dengan ujian tiga paksi tak terkukuh dan tak bersalir dan keputusan berikut ditunjukkan dalam Jadual B2(a). Tentukan kejelekitan dan sudut geseran tanah.

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

Cell pressure / *Tekanan Keliling* , σ_3 (kN/m^2)	Additional axial load at failure / *Tambahan beban semasa kegagalan,* σ_2 (kN/m^2)	Pore water pressure / *Tekanan air liang,* μ (kN/m^2)
200	650	50
400	770	200
600	880	350

[10 marks]

[*10 markah*]

CLO2

(b) A series of Triaxial Test were tested on a soil sample and the following results obtained shown in Table B2 (b)**.** Using a graph, specify the value of soil strength parameters.

Satu siri Ujian Tiga Paksi telah dilakukan keatas sampel tanah dan data keputusan ujian ditunjukkan dalam Jadual B2 (b). Dengan menggunakan graf, nyatakan nilai parameter kekuatan tanah.

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

Test no. *No. Ujian*	Cell Pressure, σ_3 (kN/m^2) *Tekanan Keliling, σ_3 (kN/m^2)*	Major Principal Stress, σ_1 (kN/m^2) *Tegasan Utama, σ_1 (kN/m^2)*	Pore Water Pressure, μ (kN/m^2) *Tekanan air liang, μ (kN/m^2)*
1	17	157	12
2	44	201	20
3	56	225	22

[15 marks]

[*15 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) A 5m layer of clay is overlaid by a 3m layer of sand. The groundwater level is located at 1.5m below surface. Above the ground water level, the weight of sand is 19.4kN/m^3, whereas the saturated unit weight for sand and clay at 21.4kN/m^3 and 18.6kN/m^3 respectively. Calculate the total stress, pore water pressure and effective stress of the soil profile.

Satu lapisan tanah liat yang tebalnya 5m ditindih oleh lapisan pasir setebal 3m. Aras air bumi berada pada paras 1.5m di bawah permukaan bumi. Di atas aras air bumi, berat unit pasir adalah 19.4kN/m^3, manakala berat unit pasir tepu dan tanah liat masing-masing adalah 21.4kN/m^3 dan 18.6kN/m^3. Kirakan jumlah tegasan, tekanan air liang dan tegasan berkesan bagi profil tanah tersebut.

[10 marks]

[*10 markah*]

CLO2 (b) Refer to Figure B3(b), by using Rankine Theory, calculate the magnitude and position of active thrust that acts behind the wall.

Berdasarkan kepada Rajah B3(b) di bawah, dengan menggunakan Teori Rankine kirakan magnitud dan kedudukan tujah aktif yang bertindak di belakang tembok.

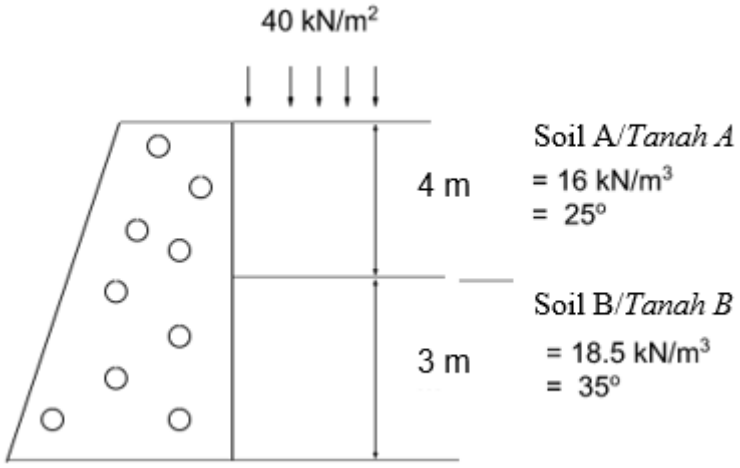

Figure B3(b)/ *Rajah B3(b)*

[15 marks]

[*15 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Construct the flow net for the single row of a sheet pile driven into permeability layer soil as shown in Figure B4 (a) using the scale 1m : 2cm to obtain the quantity of seepage in m^3/day/m length of sheet pile.

Bina jaringan aliran bagi sebatang cerucuk tunggal yang dipacu ke dalam satu lapisan telap yang ditunjukkan dalam Rajah B4 (a) menggunakan skala 1m: 2cm untuk mendapatkan kadar resipan dalam unit m^3/hari/m panjang cerucuk.

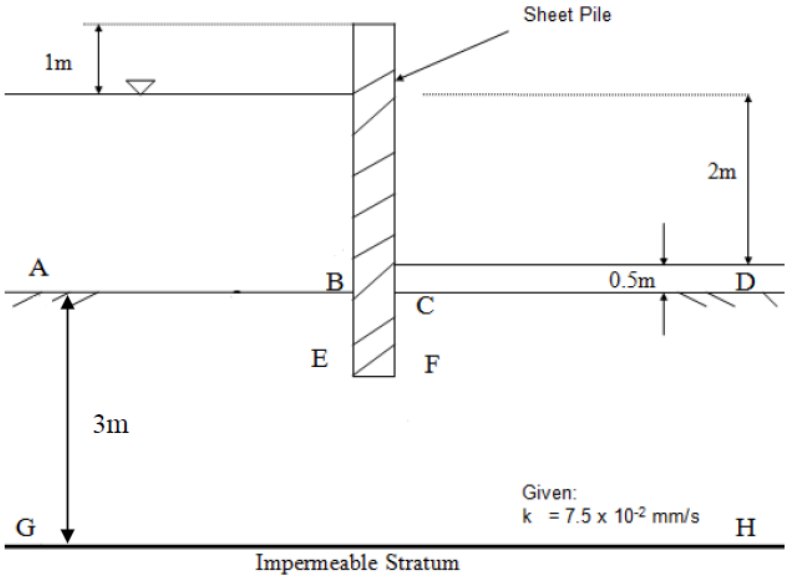

Figure B4 (a) / *Rajah B4 (a)*

[10 marks]

[*10 markah*]

CLO2 (b) Analyse the value factor of safety of a soil slope shown in Table B4(b) by using Fellenius slices method. The soil properties are Cu = 13.5kN/m^2, γ = 16.5kN/m^3 and ϕ = 15°.

Analisa nilai faktor keselamatan bagi cerun tanah yang ditunjukkan pada Jadual B4(b) dengan menggunakan kaedah hirisan Fellenius. Diberi sifat-sifat tanah tersebut adalah Cu = 13.5kN/m^2, γ = 16.5kN/m^3 dan ϕ = 15°.

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

Slice *Potongan*	α^o	Height of slice, Z(m) *Tinggi*	Width of slice, b(m) *Lebar*
1	-7	3.4	2.5
2	5°	5.5	2.0
3	18°	6.8	2.0
4	25°	5.8	2.0
5	40°	4.6	2.0
6	55°	2.8	2.0

[15 marks]

[*15 markah*]

SOALAN TAMAT

LIST OF FORMULA FOR DCC30093: GEOTECHNICAL ENGINEERING

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

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

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

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

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

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

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

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

$$PI = LL - PL$$

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

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

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

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

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

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

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

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

$$u = \gamma_\omega h$$

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

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

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

$$\sigma_a = k_a \gamma z$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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