SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

CC304: GEOTECHNICS 1

TARIKH : 05 APRIL 2016
TEMPOH : 2.30 PM – 4.30 PM (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.
Bahagian A: Pendek (10 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : Kertas Graf, Formula dsb

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 40 MARKS

BAHAGIAN A : 40 MARKAH

INSTRUCTION:

This section consists of **TEN (10)** short questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **SEPULUH (10)** soalan pendek. Jawab **SEMUA** soalan.*

CLO1
C1

QUESTION 1

List **FOUR (4)** processes involved in a rock cycle.

SOALAN 1

*Senaraikan **EMPAT (4)** proses yang terlibat di dalam kitaran batuan.*

[4 marks]

[4 *markah*]

CLO1
C2

QUESTION 2

Sketch the rock cycle formation process.

SOALAN 2

Lakarkan kitaran proses pembetukan batuan.

[4 marks]

[4 *markah*]

CLO1
C2

QUESTION 3

Differentiate between top soil and transported soil.

SOALAN 3

Bezakan antara tanah atas dan tanah baki.

[4 marks]

[*4 markah*]

CLO1
C1

QUESTION 4

List **TWO (2)** methods to determine the following test:

i) Grain size analysis

ii) Liquid limit

SOALAN 4

*Senaraikan **DUA (2)** kaedah untuk menentukan ujian berikut:*

i) Analisis saiz zarah

ii) Had cecair

[4 marks]

[*4 markah*]

CLO1
C2

QUESTION 5

A specimen of clay was tested in the laboratory and the following data were collected :

Mass of wet specimen, $M_1 = 156.8g$

Mass of dry specimen, $M_2 = 132.4g$

Volume of wet specimen, $V_T = 105.3cm^3$

Specific gravity of particles, $G_S = 2.69$

Determine :

i) Water content

ii) Bulk density

SOALAN 5

Satu ujikaji telah dijalankan ke atas specimen tanah liat, berikut adalah data yang diperolehi :

Jisim specimen basah, $M_1 = 156.8g$

Jisim specimen kering, $M_2 = 132.4g$

Isipadu specimen basah, $V_T = 105.3cm^3$

Graviti Tentu Partikel, $G_S = 2.69$

Tentukan :

i) Kandungan air

ii) Ketumpatan pukal

[4 marks]

[*4 markah*]

CLO1
C2

QUESTION 6

Given the plastic limit and liquid limit of soil is 23% and 48% respectively. Determine the plasticity index of the soil.

SOALAN 6

Diberi satu sampel tanah mempunyai had plastik dan had cecair 23% dan 48%. Kirakan indek plastik bagi tanah tersebut.

[4 marks]

[*4 markah*]

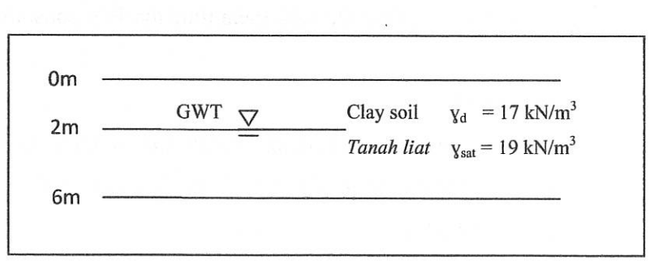
CLO1
C2

QUESTION 7

Based on the figure below, calculates the effective stress at 6 m depth.

SOALAN 7

Berdasarkan rajah di bawah, kirakan tegasan berkesan pada kedaman 6 m.



[4 marks]

[*4 markah*]

CLO1
C1

QUESTION 8

List **FOUR (4)** factors affecting the permeability.

SOALAN 8

*Senaraikan **EMPAT (4)** faktor yang mempengaruhi kebolehtelapan.*

[4 marks]

[4 markah]

CLO1
C2

QUESTION 9

During a constant-head permeability test on a sand sample, 450 ml of water were collected in 4 min. If the sample had a length of 150 mm, a diameter of 55 mm and a maintained head of 300 mm, calculate the coefficient of permeability.

SOALAN 9

Semasa ujian kebolehtelapan turus tetap dijalankan ke atas sampel pasir, 450 ml air telah dikumpulkan dalam masa 4 min. Jika sampel tersebut mempunyai panjang 150 mm, diameter 55 mm dan tekanan turus dikekalkan 300 mm, kirakan pekali kebolehtelapan.

[4 marks]

[*4 markah*]

CLO1
C2

QUESTION 10

The coefficient of consolidation (Cv) for clay was found to be 4.93 mm^2/min. The thickness of specimen during the stage was 18.27 mm. The clay layer is fully drained top and bottom. Calculate the settlement time for 90% consolidation.

SOALAN 10

Pekali pengukuhan (Cv) untuk tanah liat adalah 4.93 mm^2/min. Ketebalan spesimen semasa peringkat ini adalah 18.27 mm. Lapisan tanah liat tersebut dialirkan sepenuhnya atas dan bawah. Kira masa pengenapan bagi pengukuhan 90%.

[4 marks]

[*4 markah*]

SECTION B : 60 MARKS

BAHAGIAN B : 60 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **THREE (3)** soalan sahaja.*

CLO1
C2

QUESTION 1

SOALAN 1

A 72 cm^3 sample of moist soil weighs 141.5 g. When it is dried out in an oven, it weighs 122.7g. The specific gravity of solids is found to be 2.66. Determine:

Satu sampel 72 cm^3 tanah lembap mempunyai berat 141.5 g. Setelah dikeringkan didalam oven, ia mempunyai berat 122.7g. Graviti tentu pepejal adalah 2.66. Tentukan :

i) Moisture content
Kandungan lembapan

ii) Void ratio
Nisbah rongga

iii) Porosity
Keliangan

iv) Degree of saturation
Darjah ketepuan

v) Wet unit weights
Berat unit tanah lembap

vi) Dry unit weights
Berat unit tanah kering

[20 marks]

[*20 markah*]

CLO1
C3

QUESTION 2

SOALAN 2

Standard Proctor Compaction Tests carried out on a sample of sandy clay yielded the following results:

Ujian Pemadatan Proktor Piawai telah dijalankan ke atas sampel tanah liat berpasir dan memberikan keputusan berikut:

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

i) Plot the curve of dry density against moisture content and determine the maximum dry density and optimum moisture content.

Plotkan lengkung ketumpatan kering melawan kandungan lembapan dan seterusnya tentukan nilai ketumpatan kering maksimum dan kandungan lembapan optimum.

[16 marks]

[*16 markah*]

ii) Calculate the moisture content necessary for complete saturation at this maximum dry density if the specific gravity (G_s) of the solid constituents is 2.73.

Kirakan nilai kandungan lembapan yang diperlukan untuk penepuan lengkap pada nilai ketumpatan kering maksimum jika nilai gravity tentu (G_s) tanah adalah 2.73.

[4 marks]

[*4 markah*]

QUESTION 3

SOALAN 3

CLO1
C3

On a certain site, a surface layer of sandy gravel is 7m thick and this overlies a 4m layer of clay. Determine total stress and effective stress profiles down to the bottom of the clay for the following conditions:

Pada satu tapak, satu lapisan pasir kerikil yang mempunyai ketebalan 7m berada di atas lapisan tanah liat berketebalan 4m. Tentukan tegasan jumlah, tegasan berkesan profil tanah dari permukaan tanah sehingga ke lapisan tanah liat mengikut keadaan berikut:

Unit weights:

Sandy gravel (saturated) = 21 kN /m^3

Sandy gravel (drained) = 18 kN /m^3

Clay = 19 kN /m^3

Berat unit tanah:

Pasir berkerikil (tepu) = 21 kN /m^3

Pasir berkerikil (kering) = 18 kN /m^3

Tanah Liat = 19 kN /m^3

i) Water table at the ground surface, and

aras air bumi pada permukaan tanah, dan

[10 marks]

[10 markah]

ii) Water table at the gravel and clay interface.

aras air bumi pada titik tengah lapisan antara pasir kerikil dan tanah liat.

[10 marks]

[10 markah]

CLO1
C3

QUESTION 4

SOALAN 4

A triaxial test performed on the undisturbed samples and the results are shown in **Table B4**. Given the calibration gauge load factor is 1.4 N per part. Each sample has a diameter and length at 37.5 mm and 75 mm. Determine the cohesion c and angle of friction the soil ϕ.

*Satu ujian tiga paksi dilakukan ke atas satu sampel tanah tak terganggu dan keputusannya adalah seperti dalam **Jadual B4**. Diberi faktor kalibrasi tolok beban adalah 1.4 N per bahagian. Setiap sampel mempunyai diameter dan panjang masing-masing adalah 37.5 mm dan 75 mm. Tentukan nilai kejelekitan dan sudut geseran tanah tersebut.*

Table B4 / Jadual B4

Test *Ujian*	Cell Pressure *Tekanan Sel* (kN/m^2)	Gauge Reading (Part) *Bacaan Tolok* *(Bahagian)*
1	60	77
2	160	116
3	260	157

[20 Marks]

[20 Markah]

SOALAN TAMAT

LAMPIRAN FORMULA CC 304 – GEOTECNICS 1

1. $V_t = V_s + V_v = V_s + V_w + V_a$
2. $G_s = \frac{m_s}{V_s \rho_w}$
3. $\rho_d = \frac{\rho b}{1+w}$
4. $\rho_b = \frac{Ms(1+w)}{v}$
5. $\rho_b = \frac{Gs\rho w(1+w)}{1+e}$
6. $\rho_d = \frac{Gs\rho w}{1+e}$
7. $S = \frac{wGs}{e}$
8. $\rho_{sat} = \frac{\rho w(Gs+e)}{1+e}$
9. $\rho_d = \frac{G_s \rho_w (1-A_r)}{(1+\omega G_s)}$
10. $n = \frac{e}{1+e}$
11. $k = \frac{VL}{Aht}$
12. $k = 2.303 \frac{aL}{At} \log_{10} (\frac{h_1}{h_2})$ atau $k = \frac{aL}{At} \ln (\frac{h_1}{h_2})$
13. $k = \frac{2.3039\, q\, log_{10} (\frac{r_2}{r_1})}{\pi(h_2{}^2 - h_1{}^2)}$ atau $k = \frac{q\, ln (\frac{r_2}{r_1})}{\pi(h_2{}^2 - h_1{}^2)}$
14. $k = \frac{q\, log_{10} (\frac{r_2}{r_1})}{2.727\, H\, (h_2 - h_1)}$ atau $k = \frac{q\, ln (\frac{r_2}{r_1})}{2\pi\, H\, (h_2 - h_1)}$
15. $K_H = \frac{1}{H}(K_1H_1 + K_2H_2 + ... + K_nH_n)$
16. $K_v = \frac{H}{\frac{H_1}{K_1} + \frac{H_2}{K_2} + \cdots\ldots + \frac{H_n}{K_n}}$
17. $\sigma = \rho gh = \gamma h$
18. $\sigma = \sigma' + u$
19. $u = \gamma_w h$
20. $T_v = \frac{C_v\, t}{d^2}$
21. $C_v = \frac{0.848 d^2}{t_{90}}$
22. $C_v = \frac{k}{\gamma_w M_v}$