

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2015

CC304: GEOTECHNICS 1

TARIKH : 21 OKTOBER 2015

TEMPOH : 11.15 AM – 1.15 PM (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.

Bahagian A: Pendek (10 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, Carta Keplastikan,
Formula dsb

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SULIT

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**

Define the following terms:

- i) Soil
- ii) Rock

SOALAN 1

Definisikan istilah-istilah berikut:

- i) *Tanah*
- ii) *Batu*

[4 marks]

[4 markah]

CLO1
C2**QUESTION 2**

Sketch a rock cycle and label each process, accordingly.

SOALAN 2

Lakarkan kitaran batuan dan nyatakan setiap prosesnya.

[4 marks]

[4 markah]

CLO1
C2**QUESTION 3**

Describe the terms sedimentary rock and metamorphic rock.

SOALAN 2*Jelaskan maksud batuan enapan dan batuan metamorfisis.*

[4 marks]

[4 markah]

CLO1
C1**QUESTION 4**

Define the terms moisture content and degree of saturation.

SOALAN 4*Definisikan maksud kandungan kelembapan dan darjah ketepuan.*

[4 marks]

[4 markah]

CLO1
C2**QUESTION 5**

Calculate the uniformity coefficient and the coefficient of the soil gradation, based on the followings:

$$D_{10} = 0.12\text{mm}$$

$$D_{30} = 0.43\text{mm}$$

$$D_{60} = 0.65\text{mm}$$

SOALAN 5*Tentukan pekali keseragaman dan pekali kelengkungan tanah berdasarkan data berikut:*

$$D_{10} = 0.12\text{mm}$$

$$D_{30} = 0.43\text{mm}$$

$$D_{60} = 0.65\text{mm}$$

[4 marks]

[4 markah]

CLO1
C2**QUESTION 6**

The result of Plastic Limit (PL) test on a soil sample are as follow:

Water content (%)	22.6	22.9	22.8
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Given soil Liquid Limit (LL) is 56%, determine :

i) Plastic limit

ii) Plasticity index

SOALAN 6*Keputusan ujian Had Plastik ke atas sampel tanah adalah seperti berikut:**Diberi Had Cecair tanah (LL) adalah 56%, Tentukan :*

Kandungan Air (%)	22.6	22.9	22.8
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i) Had Plastik

ii) Indek Keplastikan

[4 marks]

[4 markah]

CLO1
C2**QUESTION 7**

Explain briefly the terms horizontal stress and the effective stress terms.

SOALAN 7*Terangkan dengan ringkas istilah tegasan ufuk dan tegasan berkesan.*

[4 marks]

[4 markah]

CLO1
C1**QUESTION 8**

State TWO (2) permeability tests conducted in the laboratory and the type of soil that can be used for the test.

SOALAN 8*Berikan DUA (2) ujian kebolehtelapan yang dijalankan di makmal dan jenis tanah yang boleh digunakan untuk ujian tersebut.*

[4 marks]

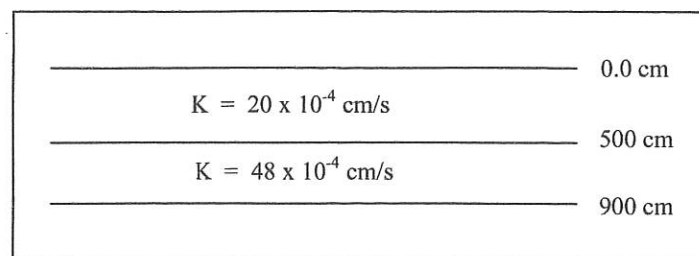
[4 markah]

CLO1
C2**QUESTION 9**

By referring to the **Figure 9A**, determine the coefficient of permeability for the soil in vertical flow.

SOALAN 9

Merujuk kepada **Rajah 9A**, tentukan nilai pekali kebolehtelapan tanah dalam arah aliran pugak.

Figure 9A / Rajah 9A

[4 marks]

[4 markah]

CLO1
C2**QUESTION 10**

Explain briefly the consolidation concept using Rheology Model.

SOALAN 10

Terangkan dengan ringkas konsep pengukuhan menggunakan Model Rheologi.

[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 struktur. Jawab **TIGA (3)** soalan sahaja.

QUESTION 1**SOALAN 1**CLO1
C3

- a) A laboratory test carried out on an undisturbed sample of soil weighing 1.74 kg and a volume of 0.001 m^3 . The determined specific gravity (G_s) of the solid is 2.6 and the dry density of the soil is 1500 kg/m^3 . Calculate:

Satu sampel tanah tak terganggu telah dijalankan ujian di makmal dan didapati berat tanah adalah 1.74 kg dan isipadu 0.001 m^3 . Penentuan nilai gravity tentu tanah (G_s) adalah 2.6 dan nilai ketumpatan kering tanah adalah 1500 kg/m^3 . Kirakan:

- i) Moisture content (m)

Kandungan lembapan (m)

[6 markah]

[6markah]

- ii) Void ratio (e)

Nisbah lompong (e)

[2 markah]

[2 markah]

- iii) Porosity (n)

Keliangan (n)

[2 markah]

[2 markah]

CLO1
C3

- b) In a liquid limit test, using a cone penetrometer method, the following readings were recorded in **Table B1**.

Di dalam ujian had cecair menggunakan kaedah penusukan kon, keputusan berikut telah rekodkan dalam Jadual B1.

Table B1 / Jadual B1

Cone penetration (mm) <i>Tusukan kon (mm)</i>	14.4	16.4	18.2	21.1	22.3
Moisture content (%) <i>Kandungan lembapan (%)</i>	30.9	42.0	51.8	68.2	77.6

In a plastic limit test on the same soil, the plastic limit was found to be 24%. Determine the Liquid Limit and the Plasticity Index of the soil, and suggest classification according to with the British Soil Classification System (BSCS).

Di dalam ujian had plastik pada tanah yang sama, didapati nilai had plastik adalah 24%. Tentukan nilai Had Cecair, Indeks Keplastikan dan jenis tanah berdasarkan Sistem Pengelasan Tanah British (BSCS).

[10 marks]

[10 markah]

QUESTION 2
SOALAN 2CLO1
C3

A set of laboratory compaction test data and result is tabulated as shown in **Table B2**.
Satu set data ujian dan keputusan pepadatan makmal adalah seperti dalam Jadual B2.

Table B2 / Jadual B2

Bulk unit weight (kN/m ²) <i>Berat unit pukal (kN/m²)</i>	18.86	20.15	21.06	21.11	20.55
Moisture content (%) <i>Kandungan lembapan (%)</i>	7.1	10.0	13.4	16.7	20.1

- i) Plot a proctor curve (i.e., dry unit weight versus moisture content).
Plotkan lengkung proktor (iaitu, unit berat kering melawan kandungan lembapan).

[16 marks]

[16 markah]

- ii) Determine the maximum dry unit weight and optimum moisture content.
Tentukan maksimum berat unit kering dan kandungan lembapan optimum.

[4 marks]

[4 markah]

CLO1
C3**QUESTION 3**
SOALAN 3

A soil profile consists of 5m thick silty sand and overlies of 4m thick clay, which in turn is underlain by impermeable rock. Given that:

Satu profil tanah terdiri daripada lapisan pasir berkeleodak setebal 5m yang melapisi tanah liat setebal 4m dan di bawahnya terdapat lapisan batuan tidak telap. Diberi:

$$\gamma_{\text{clay}} = 20 \text{ kN/m}^3$$

$$\gamma_{\text{dry}} = 17 \text{ kN/m}^3$$

$$\gamma_{\text{sat}} = 19 \text{ kN/m}^3$$

- i) Calculate the total stress and effective stress if the water table at the ground surface, and

Kirakan tegasan jumlah dan tegasan berkesan jika aras air bumi pada permukaan bumi, dan

[8 marks]

[8 markah]

- ii) Calculate total stress and effective stress if the water table at a depth of 2.5m from ground surface,

Kirakan tegasan jumlah dan tegasan berkesan jika aras air bumi pada kedalaman 2.5m daripada permukaan bumi.

[12 marks]

[12 markah]

QUESTION 4
SOALAN 4CLO1
C3

The results shown in the **Table B4** below were obtained in a series of consolidated-undrained tests failure, with pore water pressure measurement, on specimens of saturated clay. Determine the values of the effective stress parameters C' and ϕ .

Keputusan yang ditunjukkan di dalam Jadual B4 telah diperolehi daripada kegagalan di dalam satu siri ujian terkukuh tak bersalir yang mengukur tekanan air liang di dalam contoh tanah liat tepu. Tentukan nilai parameter tegasan berkesan C' dan ϕ .

Table B4 / Jadual B4

All-round pressure <i>Tekanan Sel</i> (kN/m ²)	Principal stress difference <i>Perbezaan Tekanan Utama</i> (kN/m ²)	Pore water pressure <i>Tekanan Air Liang</i> (kN/m ²)
150	192	80
300	341	154
450	504	222

[20 marks]

[20 markah]

SOALAN TAMAT

LAMPIRAN FORMULA CC 304 – GEOTECHNICS 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. $\rho_b = \frac{Gspw(1+w)}{1+e}$

6. $\rho_d = \frac{Gspw}{1+e}$

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

8. $\rho_{sat} = \frac{\rho_w(G_s+e)}{1+e}$

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. $k = 2.303 \frac{aL}{At} \log_{10} \left(\frac{h_1}{h_2} \right)$ atau $k = \frac{aL}{At} \ln \left(\frac{h_1}{h_2} \right)$

13. $k = \frac{2.3039 q \log_{10} \left(\frac{r_2}{r_1} \right)}{\pi(h_2^2 - h_1^2)}$ atau $k = \frac{q \ln \left(\frac{r_2}{r_1} \right)}{\pi(h_2^2 - h_1^2)}$

14. $k = \frac{q \log_{10} \left(\frac{r_2}{r_1} \right)}{2.727 H (h_2 - h_1)}$ atau $k = \frac{q \ln \left(\frac{r_2}{r_1} \right)}{2\pi H (h_2 - h_1)}$

15. $K_H = \frac{1}{H} (K_1 H_1 + K_2 H_2 + \dots + K_n H_n)$

16. $K_v = \frac{H}{\frac{H_1}{K_1} + \frac{H_2}{K_2} + \dots + \frac{H_n}{K_n}}$

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. $C_v = \frac{k}{\gamma_w M_v}$

Plasticity Chart

Carta Keplastikan

