

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENGAJIAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR  
SESI JUN 2014

**CC304: GEOTECHNICS 1**

**TARIKH : 01 NOVEMBER 2014  
MASA : 8.30 AM - 10.30 AM (2 JAM)**

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

Bahagian A: Soalan Pendek (10 soalan)

Bahagian B: Struktur (4 soalan)

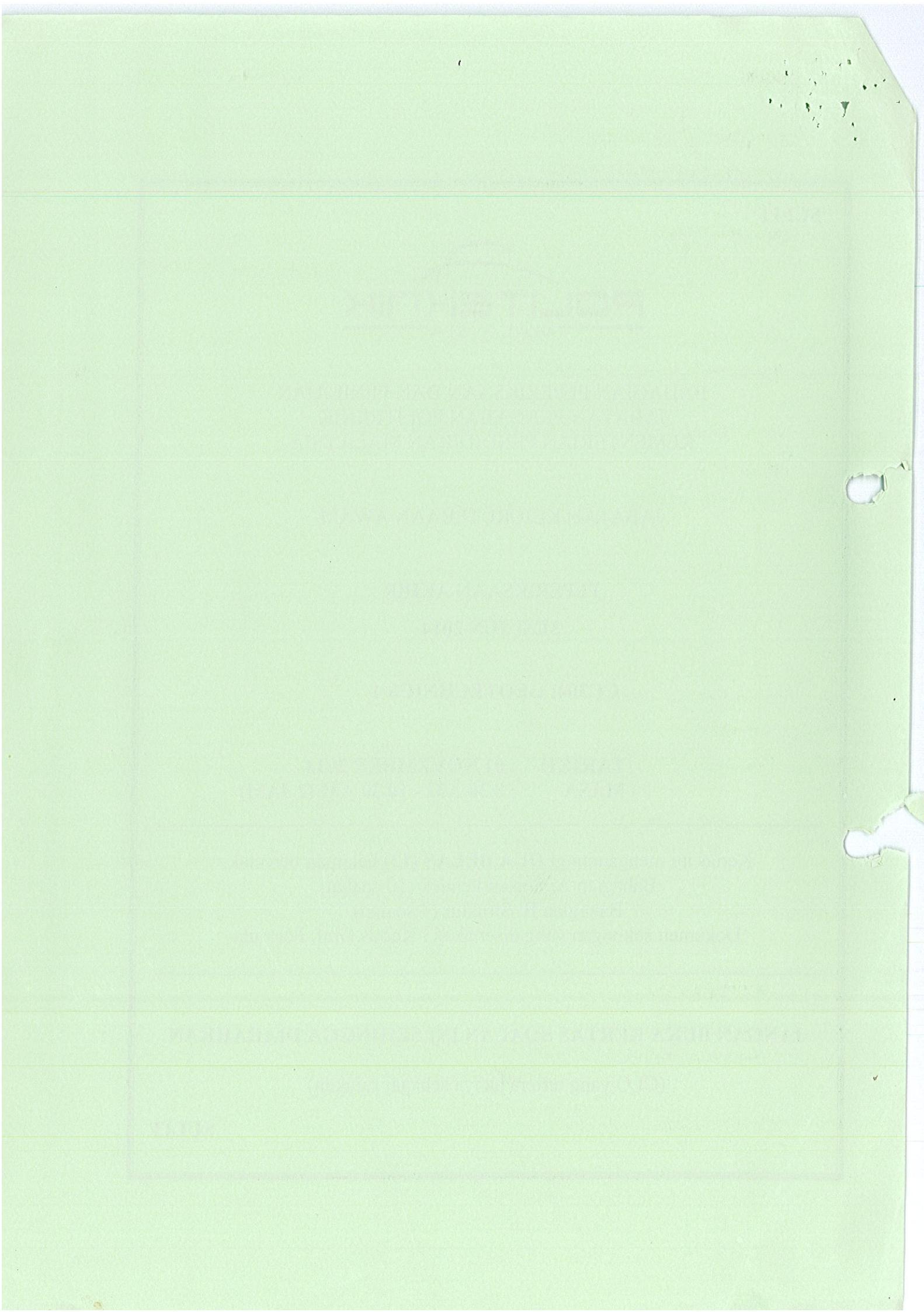
Dokumen sokongan yang disertakan : Kertas Graf, Formula

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**JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

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.

**QUESTION 1****SOALAN 1**CLO1  
C1

Describe the processes involved in a rock cycle.

[4 marks]

[4 markah]

**QUESTION 2****SOALAN 2**CLO1  
C2

Explain the soil formation process.

*Terangkan proses pembentukan tanah*

[4 marks]

[4 markah]

**QUESTION 3****SOALAN 3**CLO1  
C2

Differentiate between organic top soil and residual soil.

*Bezakan diantara tanah organik dan tanah baki.*

[4 marks]

[4 markah]

**QUESTION 4****SOALAN 4**CLO1  
C1

Define well-graded and poorly graded.

*Berikan definisi mengenai bergred baik dan bergred tidak baik.*

[4 marks]

[4 markah]

**QUESTION 5****SOALAN 5**CLO1  
C2

The undisturbed sample of soil has a wet weight of 30 kg and a volume of 0.017m<sup>3</sup>.

Calculate the wet unit weight of soil.

*Satu sampel tanah tak terganggu mempunyai berat basah 30 kg dan isipadu 0.017m<sup>3</sup>.*

*Kirakan berat unit basah tanah.*

[4 marks]

[4 markah]

**QUESTION 6****SOALAN 6**

CLO1

C2

Given that the liquid limit and the plastic limit of soil is 58% and 30%. By using the Figure A6 (Plasticity Chart), classify the type of soil.

*Diberi had cecair dan had plastik tanah ialah 58% dan 30%. Dengan menggunakan Rajah A6 (Carta Keplastikan), kelaskan jenis tanah tersebut.*

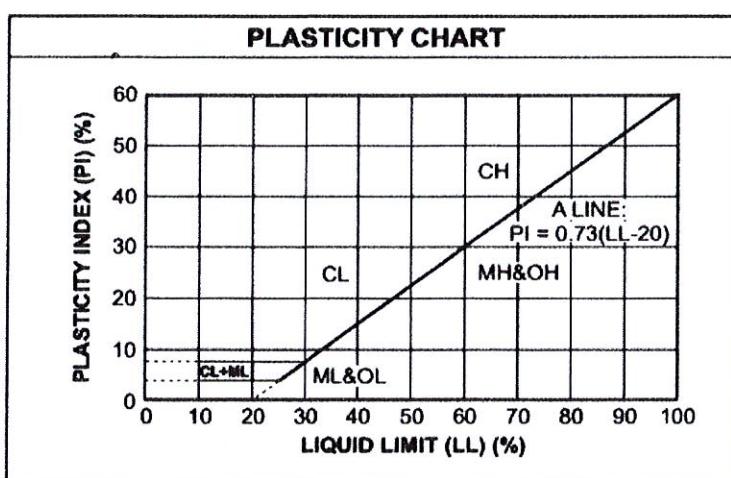


Figure A6 / Rajah A6

[4 marks]

[4 markah]

**QUESTION 7****SOALAN 7**

CLO1

C2

A soil profile has a thickness of 3m and the water table is at the ground surface. Calculate the effective stress if saturated unit weight of soil is  $18.5 \text{ kN/m}^3$ .

*Satu profil tanah mempunyai ketebalan 3m dan aras air bumi berada di permukaan tanah. Kirakan tegasan berkesan sekiranya berat unit tepsu tanah ialah  $18.5 \text{ kN/m}^3$ .*

[4 marks]

[4 markah]

**QUESTION 8****SOALAN 8**CLO1  
C1

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

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

[4 marks]

[4 markah]

**QUESTION 9****SOALAN 9**CLO1  
C2

A site investigation was conducted at a construction site. There are 3 layers of soil with the depth of 3m, 5m and 6m. The coefficient of permeability,  $k$  for each layer are  $8 \times 10^{-4}$  cm/s,  $30 \times 10^{-4}$  cm/s and  $20 \times 10^{-4}$  cm/s. Compute the average horizontal coefficient of permeability.

*Satu kawasan pembinaan diketahui profilnya mengandungi 3 lapisan tanah yang mempunyai ketebalan masing-masing 3m, 5m dan 6m. Pekali kebolehtelapan,  $k$  setiap lapisan adalah  $8 \times 10^{-4}$  cm/s,  $30 \times 10^{-4}$  cm/s dan  $20 \times 10^{-4}$  cm/s. Kira pekali kebolehtelapan bagi tanah tersebut dalam arah aliran ufuk.*

[4 marks]

[4 markah]

**QUESTION 10****SOALAN 10**CLO1  
C2

Differentiate between the compressibility coefficient,  $M_v$  and consolidation coefficient,  $C_v$ .

*Bezakan diantara pekali kebolehmampatan,  $M_v$  dan pekali pengukuhan,  $C_v$*

[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

C2

(a) A saturated soil sample has a volume of 40.5ml with the mass of 59.2g. After being dried in an oven, the mass of soil became 48.3g. If  $G_s$  is 2.7, calculate :

- i. Bulk density
- ii. Moisture content
- iii. Void ratio
- iv. Porosity

Satu sampel tanah tenu mempunyai isipadu 40.5ml dan jisimnya 59.2g. Selepas dikeringkan ke dalam ketuhar, jisimnya menjadi 48.3g. Sekiranya  $G_s$  ialah 2.7, kirakan :

- i. Ketumpatan pukal
- ii. Kandungan lembapan
- iii. Nisbah lompong
- iv. Keliangan

[10 marks]

[10 markah]

CLO1  
C3

- (b) Table B1(b) shows the results of a cone penetration test conducted on a cohesion soil sample.

*Jadual B1(b) adalah keputusan ujian penusukan kon ke atas satu sampel tanah jelekit.*

- i) Determine the liquid limit of the soil.

*Tentukan Had Kecairan tanah tersebut*

- ii) Determine the plasticity index and classify the soil, if the plastic limit of the soil is 30%,

*Tentukan indeks keplastikan dan klasifikasikan tanah tersebut, jika had keplastikan tanah tersebut ialah 30%,*

Table B1(b)

Jadual B1(b)

Average penetration (mm)	15	17.5	19	21	22.5
Average moisture content (%)	35	45	50	60	67

[10 marks]

[10 markah]

**QUESTION 2****SOALAN 2**

CLO1

C2

- (a) Describe **THREE (3)** factors affecting compaction.

*Terangkan **TIGA (3)** faktor yang mempengaruhi pemanjangan.*

[6 marks]

[6 markah]

CLO1

- (b) Table B2 (b) shows the result of the compaction test that has been done in a laboratory.

*Jadual B2 (b) menunjukkan keputusan ujikaji pemanjangan yang dijalankan di makmal.*

- i. Plot a dry density vs moisture content curve.

*Plotkan lengkung ketumpatan kering melawan kandungan lembapan*

- ii. Determine the optimum moisture content value ( $w_{optimum}$ ) and maximum dry density

*Tentukan nilai kandungan air optimum dan ketumpatan kering maksimum.*

Table B2 (b)

Jadual B2 (b)

Test no. No. Ujikaji	1	2	3	4	5
Moisture content,% <i>Kandungan Lembapan,%</i>	12.9	14.3	15.7	16.9	17.9
Bulk Density, kg/m <sup>3</sup> <i>Ketumpatan pukal, kg/m<sup>3</sup></i>	2092	2164	2152	2127	2043

[14 marks]

[14markah]

**QUESTION 3****SOALAN 3**

CLO1

C3

Soil profile with 5 m depth of silty sand and overlaid with a layer of clay with 4 m depth. These layers are also underlaid by impermeable rock. Calculate the stress distribution of the soil profile for the following conditions:

*Satu profil tanah terdiri daripada lapisan pasir berkelodak setebal 5m yang melapisi tanah liat setebal 4m dan dibawahnya terdapat lapisan batuan tidak telap. Lukiskan profil tanah tersebut dan seterusnya lukiskan gambarajah agihan tegasan berdasarkan keadaan berikut :*

- a) Water table at the ground surface

*Aras air bumi pada permukaan bumi*



- b) Water table at the depth of 2.5m from ground surface

*Aras air bumi pada kedalaman 2.5 m daripada permukaan bumi*

Given that:

Unit weight of clay,  $\gamma_{sat} = 19 \text{ kN/m}^3$

Unit Weight of silty sand,  $\gamma = 17 \text{ kN/m}^3$

Unit weight of saturated silty sand,  $\gamma_{sat} = 20 \text{ kN/m}^3$

Diberi :

*Berat unit tpu tanah liat,  $\gamma_{sat} = 19 \text{ kN/m}^3$*

*Berat unit tanah berkelodak,  $\gamma = 17 \text{ kN/m}^3$*

*Berat unit tpu tanah berkelodak,  $\gamma_{sat} = 20 \text{ kN/m}^3$*

[20 marks]

[20 markah]

**QUESTION 4****SOALAN 4**CLO1  
C3

The following results were obtained from undrained tests on specimens of saturated normally consolidated clay. Determine the cohesion,  $c'$  and friction angle  $\phi'$ .

*Keputusan berikut diperolehi daripada ujian tak tersalir pada spesimen tanah liat terkukuh tenu. Tentukan nilai kejelekitan,  $c'$  dan sudut geseran  $\phi'$*

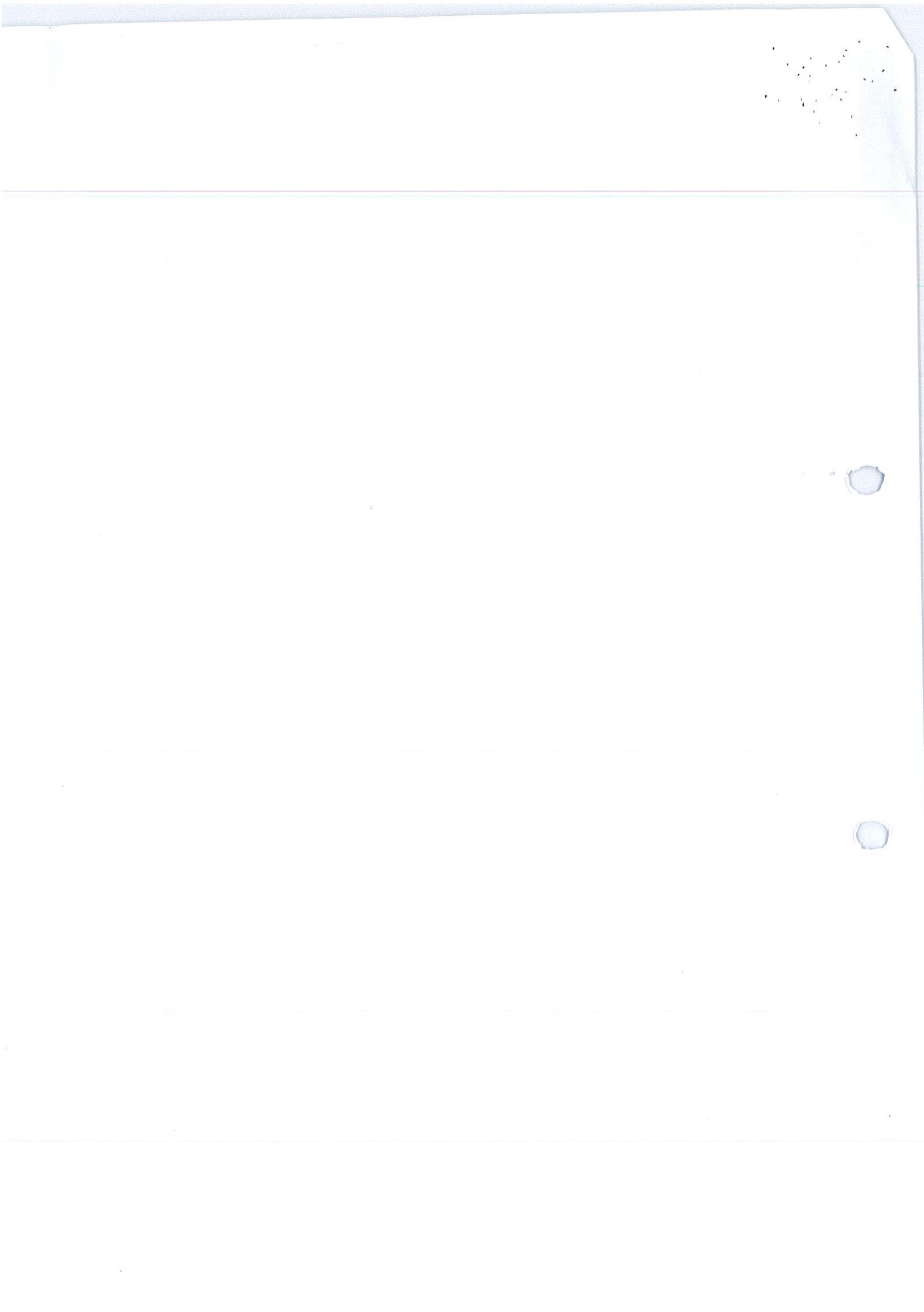
Table B4

Jadual B4

Cell pressure <i>Tekanan sel</i>	100	200	300
Deviator stress <i>Tekanan deviator</i>	137	210	283
Pore pressure <i>Tekanan air liang</i>	28	86	147

[20 marks]  
[20 markah]

**SOALAN TAMAT**



## LAMPIRAN FORMULA CC304 – GEOTECHNICS 1

$$1. V_t = V_s + V_v = V_s + V_w + V_a$$

$$2. G_s = \frac{m_s}{V_s \rho_w}$$

$$3. \rho_d = \frac{\rho_b}{1+w}$$

$$4. \rho_b = \frac{G_s \rho_w (1+w)}{v}$$

$$5. \rho_b = \frac{G_s \rho_w (1+w)}{1+\epsilon}$$

$$6. \rho_d = \frac{G_s \rho_w}{1+\epsilon}$$

$$7. S = \frac{w G_s}{\epsilon}$$

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

$$9. \rho_d = \frac{G_s \rho_w (1-A_r)}{(1+\omega G_s)}$$

$$10. n = \frac{e}{1+e}$$

$$11. k = \frac{VL}{Aht}$$

$$12. k = 2.303 \frac{al}{At} \log_{10} \left( \frac{h_1}{h_2} \right) \text{ atau } k = \frac{al}{At} \ln \left( \frac{h_1}{h_2} \right)$$

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

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

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

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

$$17. \sigma = \rho g h = \gamma h$$

$$18. \sigma = \sigma' + u$$

$$19. u = \gamma_w h$$

$$20. T_v = \frac{C_v t}{d^2}$$

$$21. C_v = \frac{0.848 d^2}{t_{90}}$$

$$22. C_v = \frac{k}{\gamma_w M_v}$$

$$\rho_b = \frac{M_T}{V_T}$$

$$= 1.6983$$

$$= 9.8174 \times 10^{-4}$$

$$V_I = \pi r^2 h$$

$$= \pi (0.05)^2 (0.125)$$

$$= 9.8174 \times 10^{-4}$$

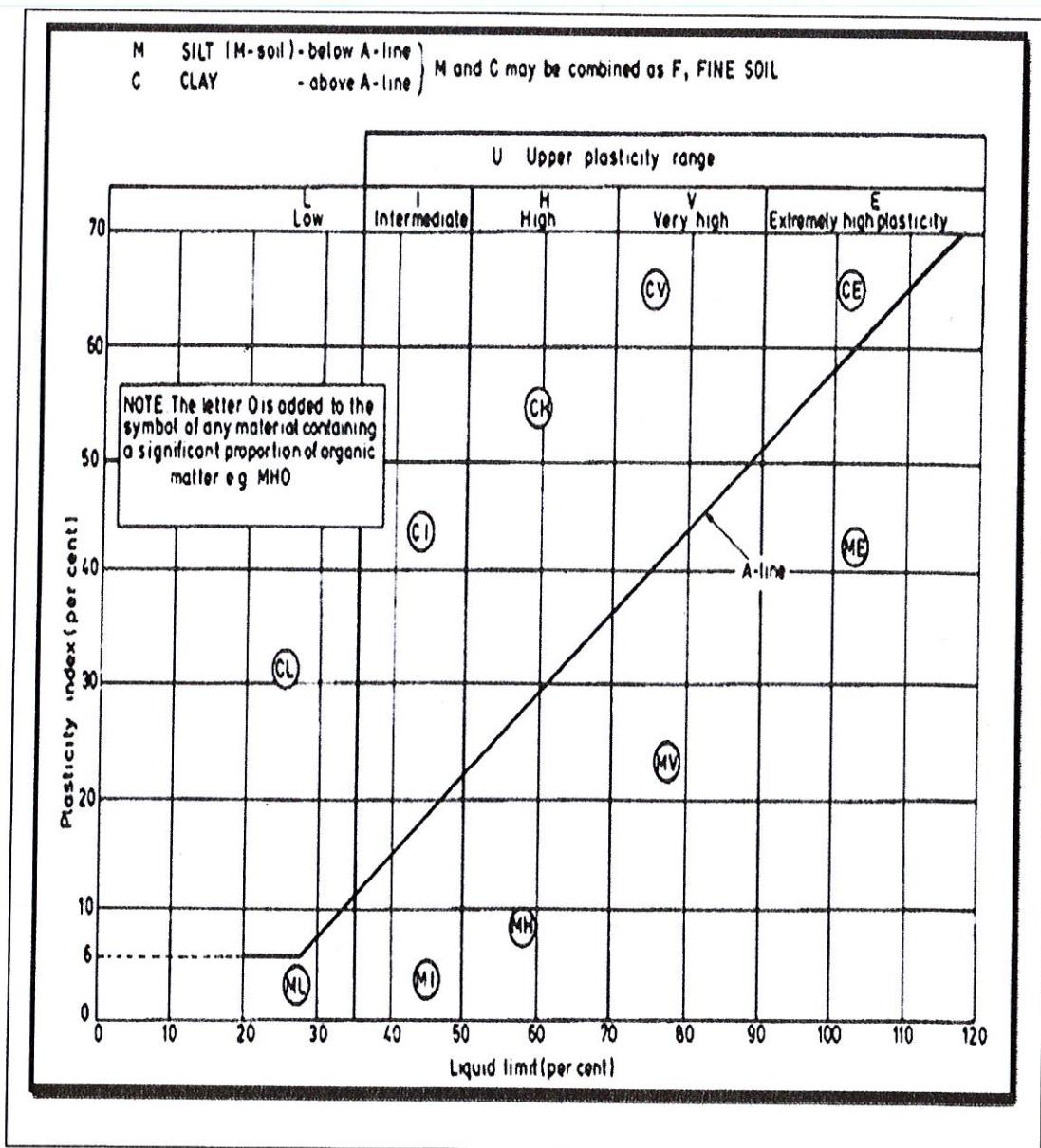
$$= 0.00098$$

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

$$= 1729.65$$

$$= 1 + \left( \frac{M_T - M_S}{M_S} \right)$$

$$= \frac{1729.65}{1 + \left( \frac{14.1 - 13.5}{13.5} \right) 0.0444}$$



Sand ✓