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 : 2025/2026

DCC30362: GEOTECHNICAL ENGINEERING

TARIKH : 08 MEI 2026
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.
Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula & Kertas Graf

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** subjective questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1

(a) Site investigation is a systematic process of collecting information on soil, rock, groundwater and site conditions to support safe and economical design and construction of civil engineering structures.

Penyiasatan tapak ialah satu proses sistematik untuk mengumpul maklumat berkaitan tanah, batuan, air bawah tanah dan keadaan tapak bagi menyokong reka bentuk serta pembinaan struktur kejuruteraan awam yang selamat dan ekonomik.

i. Identify **FOUR (4)** the importances of site investigation in civil engineering.

*Kenal pasti **EMPAT (4)** kepentingan penyiasatan tapak dalam kejuruteraan awam.*

.[4 marks]

[*4 markah*]

ii. Explain **TWO (2)** of work procedures involved in carrying out a site investigation.

*Terangkan **TWO (2)** daripada prosedur kerja yang terlibat dalam pelaksanaan penyiasatan tapak.*

[4 marks]

[*4 markah*]

CLO1

(b) Figure 1(b) shows a flow net of a concrete dam. Given the coefficient of permeability of the soil is $2.5x10^{-2}$ cm/s. Calculate the quantity of seepage, Q in m^3/hour/m length and pore water pressure at point A.

Rajah 1(b) 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.

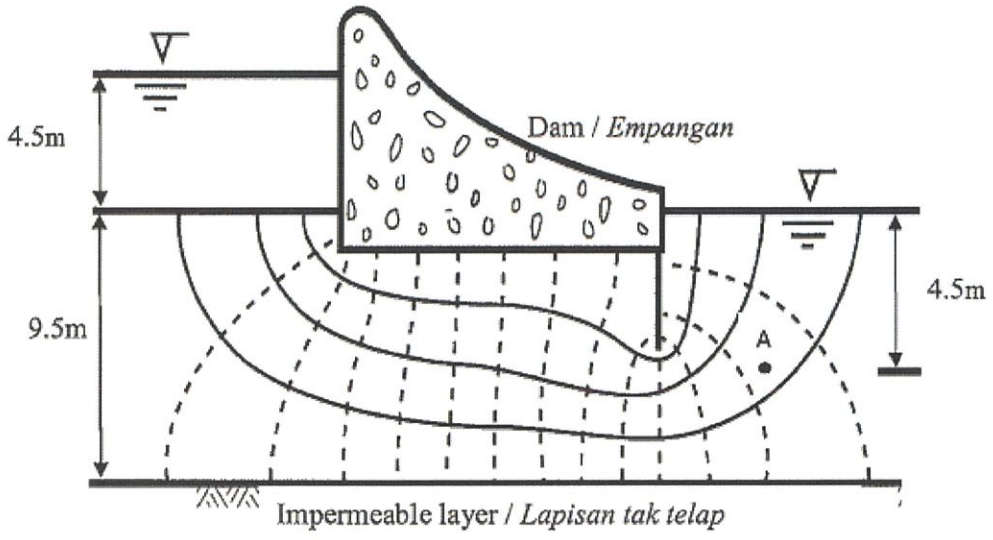

Figure 1(b) / *Rajah 1(b)*

[8 marks]

[*8 markah*]

CLO1

(c) Based on the Figure 2(c) below, calculate the seepage force at point X and Y.
Berdasarkan Rajah 2 (c) di bawah, kirakan daya resipan di titik X dan Y.

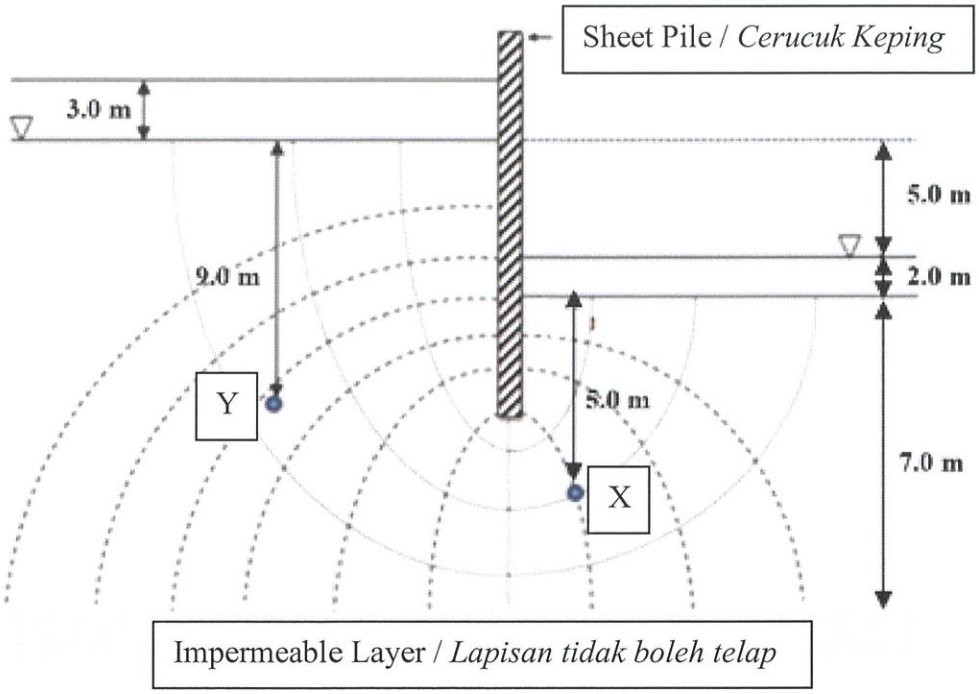

Figure 2(c) / *Rajah 2(c)*

[9 marks]
[*9 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Explain the **FOUR (4)** causes of slope failure.

*Terangkan **EMPAT (4)** punca-punca kegagalan cerun.*

[4 marks]

[*4 markah*]

CLO1 (b) The following Figure 2(b) show the sliding slope failure.

Rajah 2(b) berikut menunjukkan kegagalan cerun jenis gelinciran.

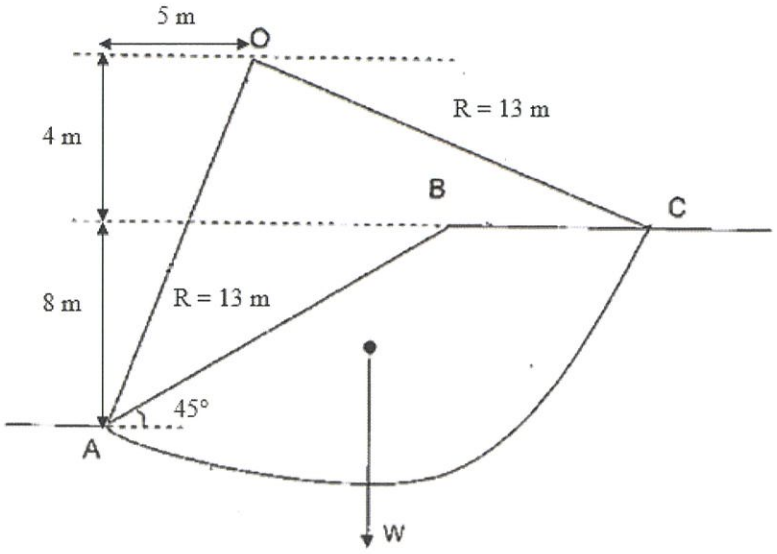

Figure 2(b) / *Rajah 2(b)*

i. Draw a slope failure by using the Total Stress Analysis Method.

Lukiskan kegagalan cerun dengan menggunakan Kaedah Analisis Tegasan Jumlah.

[6 marks]

[*6 markah*]

ii. Determine the value of area A and angle of failure plane θ.

Tentukan nilai luas A dan sudut kegagalan θ.

[7 marks]

[*7 markah*]

CLO1

(c) Table 2(c) shows some data obtained from the slope stability analysis. Analyze the factor of safety against slip failure of the slope.

Given; $\gamma = 20$ kN/m^3, $c = 7.5$ kN/m^2 and $\theta = 10°$

Jadual 2(c) menunjukkan sebahagian data yang diperolehi hasil daripada analisis kestabilan cerun. Analisakan faktor keselamatan terhadap kegagalan cerun.

Diberi; $\gamma = 20$ kN/m^3, $c = 7.5$ kN/m^2 dan $\theta = 10°$

Table 2(c) / *Jadual 2(c)*

Slices/ *Hirisan*	b (m)	α°	z (m)
1	4.0	-5	2.8
2	4.0	3	4.7
3	4.0	16	5.6
4	4.0	23	4.9
5	4.0	38	3.5

[8 marks]

[*8 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) Explain **FOUR (4)** applications of retaining walls in construction.

*Terangkan **EMPAT (4)** kegunaan dinding penahan dalam pembinaan.*

[4 marks]

[*4 markah*]

CLO1 (b) The retaining wall is shown in Figure 3(b) with the given properties of soil. Using Rankine Theory determine:

Dinding penahan tanah ditunjukkan dalam Rajah 3(b) dengan sifat-sifat tanah yang diberikan. Dengan menggunakan Teori Rankine, tentukan:

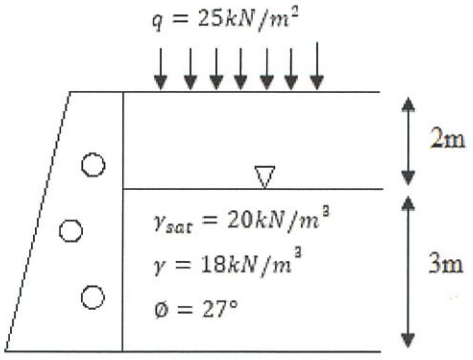

Figure 3(b) / *Rajah 3(b)*

i. The total active earth pressure.

Jumlah tekanan aktif tanah.

[6 marks]

[*6 markah*]

ii. The position of the active thrust.

Kedudukan tujah aktif tanah.

[7 marks]

[*7 markah*]

CLO1

(c) Calculate factor of safety with respect to bearing capacity for the cantilever retaining wall as shown in Figure 3(c).
Kirakan faktor keselamatan terhadap keupayaan galas bagi dinding penahan jenis julur seperti yang ditunjukkan dalam Rajah 3(c).

Given/ *Diberi* :
Unit weight of soil / *Berat isi padu tanah,* $\gamma_{soil} = 17.5$ kN/m^3
Unit weight of concrete / *Berat isi padu konkrit,* $\gamma_{concrete} = 24$ kN/m^3
Ultimate bearing capacity / *Keupayaan Galas Muktamad,* $q_{ult} = 215$ kN/m^2
Coefficient of friction / *Pekali Geseran,* $\mu = 0.8$

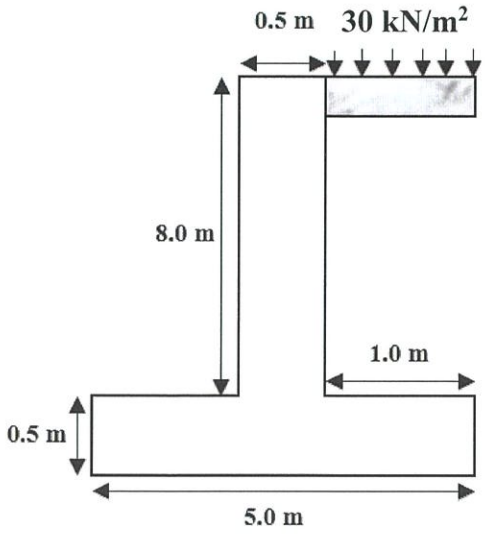

Figure 3(c) / *Rajah 3(c)*

[8 marks]
[*8 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Illustrate **TWO (2)** types of retaining wall.

*Gambakan **DUA (2)** jenis tembok penahan.*

[4 marks]

[*4 markah*]

CLO1 (b) A square footing measuring 2 m x 2 m is founded 3 m below the ground surface. The soil has a cohesion of c = 55 kN/m^2, a unit weight of γ = 18.66 kN/m^3, a saturated unit weight of γ_{sat} = 21.31 kN/m^3, and an angle of internal friction θ = 25°. The groundwater table is at the ground surface.

Satu tapak asas berbentuk segi empat sama berukuran 2 m × 2 m didirikan pada kedalaman 3 m dari aras tanah. Tanah mempunyai kejelikitan c = 55 kN/m^2, berat unit tanah γ = 18.66 kN/m^3, berat unit tanah tepu γ_{sat} = 21.31 kN/m^3 dan sudut geseran dalaman θ = 25°. Paras air bawah tanah berada pada aras tanah.

i. Calculate the ultimate bearing capacity of the foundation.

Kirakan kapasiti galas muktamad tapak asas.

[6 marks]

[*6 markah*]

ii. Calculate the safe bearing load of the foundation using a factor of safety of 3.

Kirakan beban galas selamat tapak asas tersebut menggunakan faktor keselamatan 3.

[7 marks]

[*7 markah*]

CLO1

(c) A design requires placing a square foundation at 1 m depth to carry a column load of 1500 kN. The properties are cohesion, c' = 15 kN/m^2, an angle of internal friction, θ = 24° and a unit weight of γ = 18.5 kN/m^3. Using Terzaghi's bearing capacity theory, analyse the width (B) of the foundation.

Reka bentuk memerlukan asas berbentuk segi empat sama diletakkan pada kedalaman 1 m untuk menampung beban tiang sebanyak 1500 kN. Nilai kejelekitan, c' = 15 kN/m^2, sudut geseran dalaman, θ = 24° dan berat unit tanah, γ = 18.5 kN/m^3. Dengan menggunakan teori kapasiti galas Terzaghi, analisis lebar, (B) bagi asas tersebut.

[8 marks]

[*8 markah*]

SOALAN TAMAT

LAMPIRAN FORMULA DCC30362 GEOTECHNICAL ENGINEERING

$$Q = k\,H\,\frac{n_f}{n_e}$$

$$u = h_w\,\gamma_w$$

$$u_x = \gamma_w \cdot \frac{ne}{Ne} H - (-z_x)$$

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

$$Ps = h\,\gamma_w$$

$$FOS = \frac{\mathrm{c}\,\Sigma \mathrm{L}\,[\Sigma w\,kos\alpha\ \mathrm{x}\tan\theta]}{\Sigma\, w \sin\alpha}$$

$$FOS = \frac{\mathrm{C}R^2\theta}{\gamma\,\mathrm{A}\,d}$$

$$\mathrm{k_a} = \frac{1 - sin\theta}{1 + sin\theta}$$

$$P_v = \frac{Q_v}{B}\left[1 + \frac{6e}{B}\right]$$

$$F_s = \frac{q_f}{P_{v\,max}}$$

$$FOS = \frac{Q_v \mu}{Q_H}$$

$$FOS = \frac{\mu R}{\mu T}$$

$$e = B/2\ - \bar{\mathrm{x}}$$

CORRECTION TABLE $\frac{\Delta a}{a+\Delta}$ EARTH DAM (NON FILTER)

Slope, α	30	60	90	120	150	180
$\frac{\Delta a}{a+\Delta}$	0.37	0.32	0.25	0.18	0.10	0

LAMPIRAN FORMULA DCC30362 GEOTECHNICAL ENGINEERING

STRIP FOUNDATION

$$q_u = C_u N_c + \gamma D N_q + 0.5\gamma B N\gamma$$

CIRCLE FOUNDATION

$$q_u = 1.3C_u N_c + \gamma D N_q + 0.3\gamma B N\gamma$$

SQUARE FOUNDATION

$$q_u = 1.3C_u N_c + \ + \gamma D N_q + 0.4\gamma B N\gamma$$

RECTANGULAR FOUNDATION

$$q_u = C_u N_c + [1 + 0.3\left(\frac{B}{L}\right)] + \gamma D N_q q + 0.5\gamma B N\gamma [1 - 0.2\left(\frac{B}{L}\right)]$$

TERZAGHI BEARING CAPACITY FACTORS

ϕ'	N_c	N_q	N_γ[a]	ϕ'	N_c	N_q	N_γ[a]
0	5.70	1.00	0.00	26	27.09	14.21	9.84
1	6.00	1.10	0.01	27	29.24	15.90	11.60
2	6.30	1.22	0.04	28	31.61	17.81	13.70
3	6.62	1.35	0.06	29	34.24	19.98	16.18
4	6.97	1.49	0.10	30	37.16	22.46	19.13
5	7.34	1.64	0.14	31	40.41	25.28	22.65
6	7.73	1.81	0.20	32	44.04	28.52	26.87
7	8.15	2.00	0.27	33	48.09	32.23	31.94
8	8.60	2.21	0.35	34	52.64	36.50	38.04
9	9.09	2.44	0.44	35	57.75	41.44	45.41
10	9.61	2.69	0.56	36	63.53	47.16	54.36
11	10.16	2.98	0.69	37	70.01	53.80	65.27
12	10.76	3.29	0.85	38	77.50	61.55	78.61
13	11.41	3.63	1.04	39	85.97	70.61	95.03
14	12.11	4.02	1.26	40	95.66	81.27	115.31
15	12.86	4.45	1.52	41	106.81	93.85	140.51
16	13.68	4.92	1.82	42	119.67	108.75	171.99
17	14.60	5.45	2.18	43	134.58	126.50	211.56
18	15.12	6.04	2.59	44	151.95	147.74	261.60
19	16.56	6.70	3.07	45	172.28	173.28	325.34
20	17.69	7.44	3.64	46	196.22	204.19	407.11
21	18.92	8.26	4.31	47	224.55	241.80	512.84
22	20.27	9.19	5.09	48	258.28	287.85	650.67
23	21.75	10.23	6.00	49	298.71	344.63	831.99
24	23.36	11.40	7.08	50	347.50	415.14	1072.80
25	25.13	12.72	8.34				