SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2025/2026

DBM10013 : ENGINEERING MATHEMATICS 1

TARIKH : 27 NOVEMBER 2025
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf dan Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

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

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO1 (a) Express each of the following expression in the simplest form:

Ungkapkan setiap yang berikut dalam bentuk yang termudah:

i. $-4x(2x+5)-5(x^2+3)$

[3 marks]

[*3 markah*]

ii. $\dfrac{y^2-1}{y^2-2y-3} \div \dfrac{8y}{(y-3)}$

[4 marks]

[*4 markah*]

CLO1 (b) Solve the following quadratic equation by Completing the Square Method.

Selesaikan persamaan kuadratik berikut dengan kaedah Penyempurnaan Kuasa Dua.

$$x^2-5x-14=0$$

[5 marks]

[*5 markah*]

CLO2 (c) Solve each of the following partial fractions:

Selesaikan setiap pecahan separa berikut:

i. $\dfrac{5x}{(4x-3)(x+2)}$

[5 marks]

[*5 markah*]

ii. $\dfrac{3x^2}{(x^2+3)(x-2)}$

[8 marks]

[*8 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Given $M = 2 - 12i,\ N = -4 + 3i$ and $O = -2 - 2i$. Calculate the following in the form of $a + bi$.

Diberi $M = 2 - 12i,\ N = -4 + 3i$ *dan* $O = -2 - 2i$. *Kira yang berikut dalam bentuk* $a + bi$.

i. $M - 2N$

[3 marks]

[*3 markah*]

ii. $\frac{O}{M}$

[5 marks]

[*5 markah*]

CLO1 (b) Calculate the modulus and argument for $K = -6 - 7i$. Based on your answer, sketch the Argand Diagram.

Hitung modulus dan hujah bagi $K = -6 - 7i$. *Berdasarkan jawapan anda, lakar Rajah Argand.*

[7 marks]

[*7 markah*]

CLO2 (c) Solve:
Selesaikan:

i. $(7 + 3i) \times (5\angle 150°)$ in polar form
$(7 + 3i) \times (5\angle 150°)$ *dalam bentuk polar*

[5marks]
[5 *markah*]

ii. the following expression in exponential form
ungkapan berikut dalam bentuk eksponen

$$\frac{25(\cos 120° + i \sin 120°) \times 7(\cos 15° + i \sin 15°)}{10\angle 75°}$$

[5 marks]
[*5 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) Given matrix $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 3 & -2 \\ 6 & -1 & 1 \end{bmatrix}$. Express:

Diberi matriks $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 3 & -2 \\ 6 & -1 & 1 \end{bmatrix}$. *Ungkapkan:*

i. the element of $A_{22},\ A_{31},\ A_{13}$

unsur $A_{22},\ A_{31},\ A_{13}$

[3 marks]

[*3 markah*]

ii. A^T

[1 mark]

[1 *markah*]

CLO1 (b) Given matrix $R = \begin{bmatrix} 1 & 3 & 4 \\ -2 & 2 & 0 \end{bmatrix}$, $S = \begin{bmatrix} 5 & 1 & -2 \\ 2 & 4 & 3 \end{bmatrix}$, and $U = \begin{bmatrix} 4 & 0 \\ 3 & -1 \\ 3 & -2 \end{bmatrix}$,

calculate :

Diberi matriks $R = \begin{bmatrix} 1 & 3 & 4 \\ -2 & 2 & 0 \end{bmatrix}$, $S = \begin{bmatrix} 5 & 1 & -2 \\ 2 & 4 & 3 \end{bmatrix}$, $dan\ U = \begin{bmatrix} 4 & 0 \\ 3 & -1 \\ 3 & -2 \end{bmatrix}$,

kira :

i. $\frac{1}{3}R - U^T$

[5 marks]

[*5 markah*]

ii. $2SU$

[5 marks]

[*5 markah*]

CLO2 (c) Solve the following simultaneous equations by using Cramer's Rule:
Selesaikan persamaan serentak berikut menggunakan Petua Cramer:

$$2x + y - 2z = -2$$
$$x - y + 3z = 4$$
$$-3x + 3y - 4z = 10$$

[11 marks]
[*11 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Given that $\vec{S} = 4i - 2j + 4k$, $\vec{T} = -3i + 2j - k$ and $\vec{U} = 8i + 2j + 3k$.
Solve each of the following in terms of i, j and k.
Diberi $\vec{S} = 4i - 2j + 4k$, $\vec{T} = -3i + 2j - k$ *dan* $\vec{U} = 8i + 2j + 3k$.
Selesaikan setiap yang berikut dalam bentuk i, j *dan* k.

i. $\frac{1}{2}\vec{S}$

[2 marks]
[*2 markah*]

ii. $-\vec{T}$

[2 marks]
[*2 markah*]

iii. Unit vector for $\vec{U}$
Vektor unit bagi $\vec{U}$

[3 marks]
[*3 markah*]

CLO1 (b) Given that vector $\vec{P} = 6i - 2j$, $\vec{Q} = 2i + 5j$.
Diberi vektor $\vec{P} = 6i - 2j$ *and* $\vec{Q} = 2i + 5j$.

i. Compute $\vec{P} + \vec{Q}$
Hitung $\vec{P} + \vec{Q}$

[3 marks]
[*3 markah*]

ii. Draw $\vec{P} + \vec{Q}$ by using Parallelogram method on a graph paper
Lukis $\vec{P} + \vec{Q}$ *menggunakan kaedah Segiempat Selari di atas kertas graf*

[5 marks]
[*5 markah*]

CLO2 (c) Given that $\vec{A} = -2i + 6j - 3k,\ \vec{B} = 7i - 7j + 2k\ \ and\ \vec{C} = 2i - 3j + 4k.$
Calculate:
Diberi $\vec{A} = -2i + 6j - 3k,\ \vec{B} = 7i - 7j + 2k\ \ dan\ \vec{C} = 2i - 3j + 4k.$
Kirakan:

i. $\vec{A} \cdot \vec{C}$

[2 marks]
[*2 markah*]

ii. The angle between vector $\vec{A}$ and vector $\vec{B}$
Sudut di antara vektor $\vec{A}\ dan\ vektor\ \vec{B}$

[4 marks]
[*4 markah*]

iii. $\vec{B} \times \vec{C}$

[4 marks]
[*4 markah*]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS 1 (DBM10013)

QUADRATIC EQUATION

1. ***Quadratic formula***, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
2. ***Completing the square***,

$$\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$$

FORMULA OF TRIANGLE

1. ***Sine Rules;*** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
2. ***Cosine Rules;*** $\mathbf{a^2 = b^2 + c^2 - 2bc \cos A}$
3. ***Area of Triangle*** $= \frac{1}{2} ab \sin C$

MATRIX

1. ***Cofactor;*** $C = (-1)^{i+j} M_{ij}$
2. ***Adjoin;*** $Adj(A) = C^T$
3. ***Inverse of Matrix;*** $A^{-1} = \frac{1}{|A|} Adj(A)$
4. ***Cramer's Rule;***

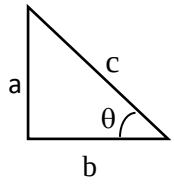
$$x = \frac{|A_1|}{|A|}, \qquad y = \frac{|A_2|}{|A|}, \qquad z = \frac{|A_3|}{|A|}$$

COMPLEX NUMBER

1. ***Modulus of*** $\boldsymbol{z} = \sqrt{a^2 + b^2}$
2. ***Argument of*** $\boldsymbol{z} = tan^{-1}\left(\frac{b}{a}\right)$
3. ***Cartesian Form***; $\boldsymbol{z} = a + bi$
4. ***Polar Form***; $\boldsymbol{z} = r \angle \theta$
5. ***Exponential Form***; $\boldsymbol{z} = re^{i\theta}$
6. ***Trigonometric Form***; $\boldsymbol{z} = r\ (\cos\theta + \mathrm{i} \sin\theta)$

TRIGONOMETRY

Pythagoras' Theorem



$$c^2 = a^2 + b^2$$

Trigonometric Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$cos^2\theta + sin^2\theta = 1$$

$$1 + tan^2\theta = sec^2\theta$$

$$1 + cot^2\theta = cosec^2\theta$$

VECTOR & SCALAR

1. ***Unit Vector***; $\hat{u} = \frac{\overline{u}}{|u|}$
2. ***Cos*** $\boldsymbol{\theta}$ $= \frac{\overline{A} \bullet \overline{B}}{|A||B|}$
3. ***Scalar Product;***

$$\vec{A} \bullet \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$$

4. ***Vector Product;***

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

5. ***Area of parallelogram ABC;***

$$\left|\overrightarrow{AB} \times \overrightarrow{BC}\right|$$

COMPOUND-ANGLE

1. $\sin\ (A \pm B) = \sin A \cos B \pm \cos A \sin B$
2. $\cos\ (A \pm B) = \cos A \cos B \mp \sin A \sin B$
3. $\tan\ (A \pm B) = \frac{tan\ A \pm tan\ B}{1 \mp \tan A \tan B}$

DOUBLE-ANGLE

1. $\sin 2A = 2 \sin A \cos A$
2. $\cos 2A = cos^2 A - sin^2 A$

$$= 1 - 2sin^2 A$$

$$= 2cos^2 A - 1$$

3. $\tan 2A = \frac{2 \tan A}{1 - tan^2 A}$