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 II : 2024/2025

DBM10163 : ENGINEERING MATHEMATICS 1

TARIKH : 16 MEI 2025
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** 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) i. Simplify the expression:
Permudahkan ungkapan berikut:

$$\frac{4x^2 + 16x}{2x^2 + 5x - 12} \div \frac{4x}{2x - 3}$$

[4 marks]
[*4 markah*]

CLO2 ii. Solve, $3x^2 - 9 = -6x$ by using completing the square method.
Selesaikan, $3x^2 - 9 = -6x$ *dengan menggunakan kaedah penyempurnaan kuasa dua.*

[6 marks]
[*6 markah*]

CLO2 (b) Solve the partial fraction.
Selesaikan pecahan separa berikut.

$$\frac{3 - 5x + 3x^2}{(1 - 2x)(1 + x^2)}$$

[7 marks]
[*7 markah*]

CLO1 (c) Referring to Diagram 1 (c), ABC is a straight line, calculate:
Merujuk Rajah 1 (c), ABC adalah garis lurus, hitung:

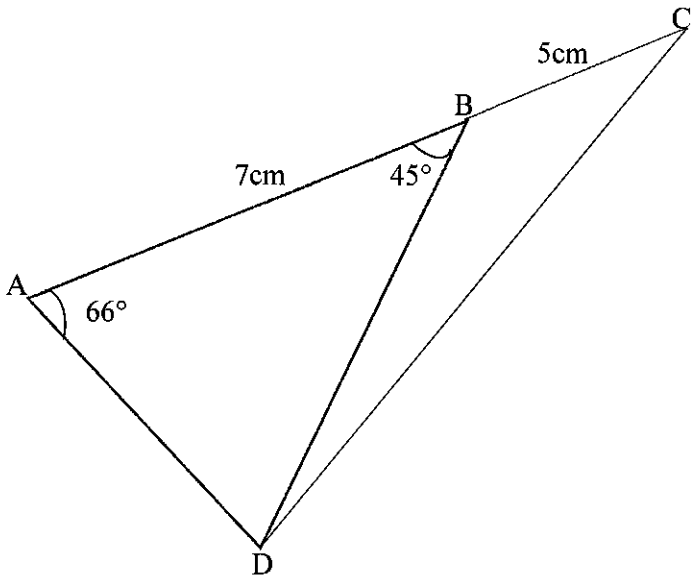


Diagram 1 (c) / *Rajah 1 (c)*

i. Length of AD

[3 marks]
[*3 markah*]

ii. Length of CD

[5 marks]
[*5 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Given that $P = 6i + 2$, $Q = -5 + 8i$ and $R = 3 + 4i$. Express the following;

Diberi $P = 6i + 2$, $Q = -5 + 8i$ *dan* $R = 3 + 4i$. *Ungkapkan yang berikut:*

i. $2P + Q$

[3 marks]

[*3 markah*]

ii. $\frac{P}{R}$

[4 marks]

[*4 markah*]

CLO2 (b) Draw the Argand Diagram for complex number, $3 - 3i$ using graph paper. Then, show the modulus and argument from the diagram.

Lukis rajah Argand bagi nombor kompleks, $3 - 3i$ *menggunakan kertas graf. Kemudian, tunjukkan modulus dan argumen daripada rajah.*

[6 marks]

[6 *markah*]

CLO2 (c) i. Solve the following expression in an exponential form.

Selesaikan ungkapan berikut dalam bentuk eksponen.

$$\frac{10\,(\cos 200^o + i\,sin\,200^o) \times 6\,(\cos 10^o + i \sin 10^o)}{20\,(\cos 70^o + i \sin 70^o)}$$

[6 marks]

[6 *markah*]

ii. Given that $Z_1 = 10(\cos 12^o + i \sin 12^o)$ and $Z_2 = 20 < 125^o$.

Solve $\frac{Z_2}{Z_1}$ in trigonometric form.

Diberi $Z_1 = 10(\cos 12^o + i \sin 12^o)$ *dan* $Z_2 = 20 < 125^o$.

Selesaikan $\frac{Z_2}{Z_1}$ *dalam bentuk trigonometrik.*

[6 marks]

[6 *markah*]

QUESTION 3

SOALAN 3

CLO1 (a) Given $P = \begin{pmatrix} 1 & -2 & -1 \\ 2 & -4 & -6 \\ 0 & 7 & 3 \end{pmatrix}$, $Q = \begin{pmatrix} 2 & 0 & 6 \\ 4 & 7 & 8 \\ 2 & 5 & 1 \end{pmatrix}$ and $R = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 4 & 6 \\ 0 & 2 & 0 \end{pmatrix}$.

Diberi $P = \begin{pmatrix} 1 & -2 & -1 \\ 2 & -4 & -6 \\ 0 & 7 & 3 \end{pmatrix}$, $Q = \begin{pmatrix} 2 & 0 & 6 \\ 4 & 7 & 8 \\ 2 & 5 & 1 \end{pmatrix}$ *dan* $R = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 4 & 6 \\ 0 & 2 & 0 \end{pmatrix}$.

Indicate:

Tunjukkan:

i. The element at $P_{22}, P_{33}, Q_{11}, R_{31}$

Unsur pada $P_{22}, P_{33}, Q_{11}, R_{31}$

[4 marks]

[*4 markah*]

ii. Q + R – P

[5 marks]

[*5 markah*]

CLO2 (b) Given that $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$ and $|AB| = -5$, compute $(AB)^{-1}$

Diberi $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$ *dan* $|AB| = -5$, *kirakan* $(AB)^{-1}$

[5 marks]

[*5 markah*]

CLO2 (c) Solve the following equations using the Cramer's Rule.

Selesaikan persamaan berikut dengan menggunakan Petua Cramer.

$$x + 3y + 2z = 3$$
$$2x - y - 3z = -8$$
$$5x + 2y + z = 9$$

[11 marks]

[*11 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Given point $A(1,2,3)$ and $B(4,-1,5)$.

Diberi titik $A(1,2,3)$ *dan* $B(4,-1,5)$.

i. Indicate the magnitude of $\overrightarrow{AB}$.

Tunjukkan magnitud bagi $\overrightarrow{AB}$.

[5 Marks]

[*5 Markah*]

ii. Represent vector $\vec{A} + \vec{B}$ using Parallelogram method.

Tunjukkan vector $\vec{A} + \vec{B}$ *graf menggunakan kaedah Segiempat Selari.*

[5 Marks]

[*5 Markah*]

CLO2 (b) Given that $\vec{A} = i + 2j + 3k$, $\vec{B} = 4i - j + 2k$ and $\vec{C} = 2i + 3j - k$.

Calculate:

Diberi $\vec{A} = i + 2j + 3k$, $\vec{B} = 4i - j + 2k$ *dan* $\vec{C} = 2i + 3j - k$. *Kira:*

i. Angle between vector $\vec{A}$ and $\vec{B}$.

Sudut antara vektor $\vec{A}$ *dan* $\vec{B}$

[6 Marks]

[*6 Markah*]

ii. Area of triangle ABC.

Luas segitiga ABC.

[9 Marks]

[*9 Markah*]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS 1 (DBM10163)

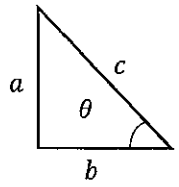
QUADRATIC EQUATION

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

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

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

1. $tan\theta = \frac{sin\theta}{cos\theta}$
2. $cos^2\theta + sin^2\theta = 1$
3. $1 + tan^2\theta = sec^2\theta$
4. $1 + cot^2\theta = cosec^2\theta$

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. $\cos 2A = cos^2A - sin^2A$
3. $tan2A = \frac{2 \tan A}{1 - tan^2A}$

Formula of Triangle

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

COMPLEX NUMBER

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

$$z_1 \times z_2 = |z_1| \cdot |z_2| \angle(\theta_1 + \theta_2)$$

8. *Division of complex number*

$$\frac{z_1}{z_2} = \frac{|z_1|}{|z_2|} \angle(\theta_1 - \theta_2)$$

MATRIX

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

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

VECTOR AND SCALAR

1. *Unit Vector,* $\hat{u} = \frac{\bar{u}}{|u|}$
2. $Cos\theta = \frac{\bar{A} \cdot \bar{B}}{|A||B|}$
3. *Scalar (dot)Product,*

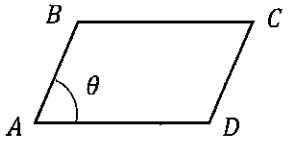
$$\vec{A} \cdot \vec{B} = a_1a_2 + b_1b_2 + c_1c_2$$

4. *Vector (cross) 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 ABCD*

$A = |\overrightarrow{AB} \times \overrightarrow{AD}|$



6. *Area of triangle ABC*

$A = \frac{1}{2}|\overrightarrow{AB} \times \overrightarrow{AC}|$