

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 DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2024/2025

DBM10163: ENGINEERING MATHEMATICS 1

TARIKH : 06 DISEMBER 2024

MASA : 8.30 PG – 10.30 PG (2 JAM)

Kertas ini mengandungi **ENAM (6)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan struktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

CLO1

- (a) i. Simplify the expression:
Mudahkan ungkapan berikut:

$$\frac{57a^3b^2c^5}{36ab^6c^4} \div 19a^2c^2$$

[4 marks]

[4 markah]

CLO2

- ii. Solve the quadratic equation by using completing the square method.
Selesaikan bagi persamaan kuadratik menggunakan kaedah penyempurnaan kuasa dua.

$$2x^2 - 3x - 12 = 0$$

[5 marks]

[5 markah]

CLO2

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

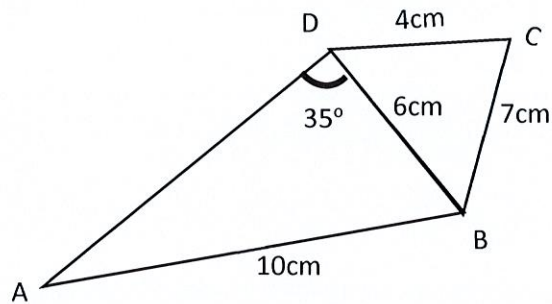
$$\frac{5x^2 - 14x - 27}{(x - 1)(x + 2)(x - 3)}$$

[8 marks]

[8 markah]

CLO1

- (c) The diagram shows a quadrilateral ABCD. Calculate:
Rajah menunjukkan segiempat ABCD. Kirakan:



i. $\angle BCD$

[4 marks]

[4 markah]

ii. $\angle BAD$

[4 marks]

[4 markah]

QUESTION 2**SOALAN 2**

- CLO1 (a) Given that $U = 3i + 2$, $V = 5 + 6i$ and $W = -4 + 7i$. Identify the following;
Diberi $U = 3i + 2$, $V = 5 + 6i$ and $W = -4 + 7i$. Tentukan yang berikut;
- i. $3W + U$ [3 marks]
 [3 markah]
- ii. V^2 [4 marks]
 [4 markah]
- CLO2 (b) Sketch the Argand diagram for $z = -7 - 4i$. Calculate the modulus and argument from the diagram.
Lakarkan rajah Argand untuk $z = -7 - 4i$. Kira modulus dan argumen daripada rajah.
- [8 marks]
 [8 markah]
- CLO2 (c) Solve the following expressions in polar form;
 Selesaikan ungkapan berikut dalam bentuk kutub;
- i. $\frac{3e^{2.2i}}{4(\cos 55^\circ + i \sin 55^\circ)}$ [4 marks]
 [4 markah]
- ii. $\frac{5 \angle 200^\circ \times (6 + 11i)}{10.9(\cos 79^\circ + i \sin 79^\circ)}$ [6 marks]
 [6 markah]

QUESTION 3**SOALAN 3**

CLO1 (a) Given that $A = \begin{pmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{pmatrix}$, $B = \begin{pmatrix} -2 & 0 & 4 \\ 2 & 6 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 7 & 6 & 9 \\ 0 & -6 & 3 \end{pmatrix}$

Diberi $A = \begin{pmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{pmatrix}$, $B = \begin{pmatrix} -2 & 0 & 4 \\ 2 & 6 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 7 & 6 & 9 \\ 0 & -6 & 3 \end{pmatrix}$

- i. Identify the element at A_{32} , B_{21} , B_{23} , C_{12}

Kenalpasti unsur pada A_{32} , B_{21} , B_{23} , C_{12}

[4 marks]

[4 markah]

- ii. Express $A^T + B - C$

Nyatakan $A^T + B - C$

[5 marks]

[5 markah]

CLO2 (b) Given that $A = \begin{pmatrix} 3 & 1 \\ 4 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$ and $|AB| = 10$, find $(AB)^{-1}$:

Diberi $A = \begin{pmatrix} 3 & 1 \\ 4 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$ dan $|AB| = 10$, dapatkan $(AB)^{-1}$.

[5 marks]

[5 markah]

- CLO2 (c) Calculate the values of a, b, and c for the following equations by using the Cramer's Rule.

Kira nilai a, b, dan c bagi persamaan berikut dengan menggunakan Cramer's Rule.

$$3a + b + c = 8$$

$$2a + 2b - c = 10$$

$$a - 3b + 2c = -4$$

[11 marks]

[11 markah]

QUESTION 4**SOALAN 4**

CLO1

(a) Given that $\vec{K} = 4i - 2j$, $\vec{L} = 4i + j$ and $\vec{M} = 2i + 6j$ *Diberi $\vec{K} = 4i - 2j$, $\vec{L} = 4i + j$ and $\vec{M} = 2i + 6j$* i. Identify vector unit for $\vec{K} + \vec{L}$ *Tentukan unit vektor bagi $\vec{K} + \vec{L}$*

[5 marks]

[5 markah]

ii. Show vector $\vec{L} + \vec{M}$ by using Parallelogram method on a graph paper.*Tunjukkan vektor $\vec{L} + \vec{M}$ menggunakan kaedah Segiempat Selari diatas kertas graf.*

[5 marks]

[5 markah]

CLO2

(b) Given that $P = i - j + 3k$, $Q = 9i + 2j + 8k$ and $R = 5i + 6k$. Calculate:*Diberi $P = i - j + 3k$, $Q = 9i + 2j + 8k$ dan $R = 5i + 6k$. Kira:*i. Angle between $\vec{PQ}$ and $\vec{QR}$ *Sudut antara $\vec{PQ}$ dan $\vec{QR}$*

[10 marks]

[10 markah]

ii. Area of triangle PQR

Luas segitiga PQR

[5 marks]

[5 markah]

SOALAN TAMAT

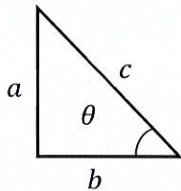
QUADRATIC EQUATION

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. $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$

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

Formula of Triangle

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

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, $z = re^{i\theta}$
6. Trigonometric Form, $z = r(\cos \theta + i \sin \theta)$
7. Multiplication of complex number
8. Division of complex number

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

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

MATRIX

1. Cofactor, $C = (-1)^{i+j} M_{ij}$
2. Adjoint, $\operatorname{Adj}(A) = C^T$
3. Inverse of Matrix, $A^{-1} = \frac{1}{|A|} \operatorname{Adj}(A)$
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, $\hat{u} = \frac{\vec{u}}{|u|}$

$$2. \cos \theta = \frac{\vec{A} \cdot \vec{B}}{|\vec{A}| |\vec{B}|}$$

3. Scalar (dot) Product,

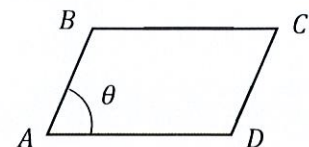
$$\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$$

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

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



6. Area of triangle ABC

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

