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)**

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

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, Formula

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**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 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.*

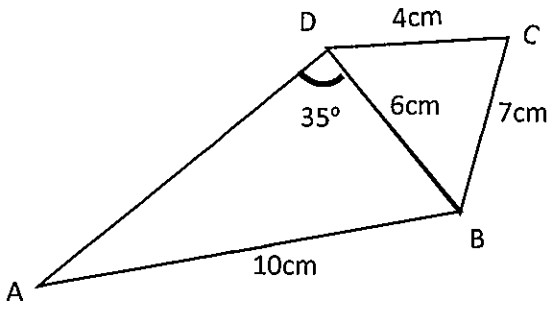
$$\frac{5x^2 - 14x - 27}{(x-1)(x+2)(x-3)}$$

[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. $\dfrac{3e^{2.2i}}{4(\cos 55^\circ + i \sin 55^\circ)}$ [4 marks]

[*4 markah*]

ii. $\dfrac{5 < 200^\circ \times (6 + 11i)}{10.9(\cos 79^\circ + i \sin 79^\circ)}$ [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 $\overrightarrow{PQ}$ and $\overrightarrow{QR}$

*Sudut antara* $\overrightarrow{PQ}$ *dan* $\overrightarrow{QR}$ [10 marks]

[*10 markah*]

ii. Area of triangle PQR

*Luas segitiga PQR* [5 marks]

[*5 markah*]

**SOALAN TAMAT**

# FORMULA SHEET FOR ENGINEERING MATHEMATICS 1 (DBM10163)

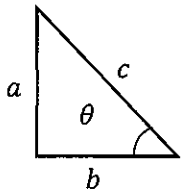
## QUADRATIC EQUATION

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,*

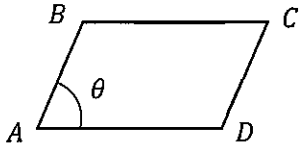
$$\vec{A} \cdot \vec{B} = a_1a_2 + b_1b_2 + c_1c_2$$

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*

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