

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 : 2023/2024

DBM10013 : ENGINEERING MATHEMATICS 1

TARIKH : 25 MEI 2024

MASA : 11.30 PAGI - 1.30 PETANG (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)

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) Simplify the following expressions to the lowest term.

Permudahkan ungkapan yang berikut kepada sebutan terendah.

i. $\frac{x^2 - 16}{3x - 12} \div (x^2 + 4x)$

[3 marks]

[3 markah]

ii. $\frac{3x + 3}{x^2 - 1} - \frac{5}{x - 1}$

[4 marks]

[4 markah]

- CLO1 (b) Solve the following quadratic equation by completing the square.

Selesaikan persamaan kuadratik berikut dengan penyempurnaan kuasa dua.

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

[5 marks]

[5 markah]

- CLO2 (c) Solve the following partial fractions.
Selesaikan pecahan separa berikut.

i. $\frac{2x}{(x^2 - 4)}$

[5 marks]

[5 markah]

ii. $\frac{3x - 1}{x^2(x - 1)}$

[8 marks]

[8 markah]

QUESTION 2**SOALAN 2**

CLO1

(a) Calculate the complex numbers below in the form of $a + bi$.*Kira nombor kompleks di bawah dalam bentuk $a + bi$.*

i. $(5 + i) - 2(-2 - 7i)$

[3 marks]

[3 markah]

ii. $\frac{4 + 3i}{-2 - 7i}$

[5 marks]

[5 markah]

CLO1

(b) Calculate the modulus, argument and sketch the Argand Diagram for $-10 - 5i$.*Hitung modulus, hujah dan lakarkan Rajah Argand untuk $-10 - 5i$.*

[7 marks]

[7 markah]

CLO2

(c)

i. Solve the following expression in an exponential form.

Selesaikan ungkapan berikut dalam bentuk eksponen.

$$\frac{45 (\cos 270^\circ + i \sin 270^\circ) \times 5 (\cos 50^\circ + i \sin 50^\circ)}{15 (\cos 110^\circ + i \sin 110^\circ)}$$

[6 marks]

[6 markah]

ii. Given that $Z_1 = 4 \angle 125^\circ$ and $Z_2 = 40 (\cos 25^\circ + i \sin 25^\circ)$. Solve the $Z_2 \times Z_1$ in polar form.*Diberi $Z_1 = 4 \angle 125^\circ$ dan $Z_2 = 40 (\cos 25^\circ + i \sin 25^\circ)$. Selesaikan $Z_2 \times Z_1$ dalam bentuk polar.*

[4 marks]

[4 markah]

QUESTION 3**SOALAN 3**

CLO1

(a) Given matrix $Z = \begin{bmatrix} 1 & 0 & 2 \\ 3 & 1 & 4 \\ 2 & 7 & 6 \end{bmatrix}$.

Diberi matriks $Z = \begin{bmatrix} 1 & 0 & 2 \\ 3 & 1 & 4 \\ 2 & 7 & 6 \end{bmatrix}$.

- i. Identify the element of Z_{12} , Z_{23} , Z_{32} .

Kenalpasti unsur-unsur Z_{12} , Z_{23} , Z_{32} .

[3 marks]

[3 markah]

- ii. Express Z^T .

Nyatakan Z^T .

[1 mark]

[1 markah]

CLO1

(b) Given that matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 5 & 3 \\ -1 & 4 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 3 \\ 5 & 2 & 2 \\ 3 & 4 & 1 \end{bmatrix}$, calculate:

Diberi matriks $A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 5 & 3 \\ -1 & 4 & 6 \end{bmatrix}$ dan $B = \begin{bmatrix} 2 & 1 & 3 \\ 5 & 2 & 2 \\ 3 & 4 & 1 \end{bmatrix}$, hitung:

- i. $A^T + 3B$.

[6 marks]

[6 markah]

- ii. Determinant A .

[4 marks]

[4 markah]

- CLO2 (c) Calculate the values of a , b and c for the following equation by using Inverse Matrix Method.

Kira nilai a , b dan c bagi persamaan berikut dengan menggunakan Kaedah Matrik Songsang.

$$\begin{aligned}2a + b - 2c &= 3 \\3a - 2b - 4c &= 10 \\a + b + 4c &= -2\end{aligned}$$

[11 marks]

[11 markah]

QUESTION 4

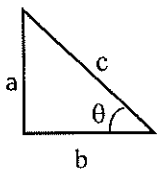
SOALAN 4

- CLO1 (a) Given that $\vec{K} = 3i + 2j - 4k$, $\vec{L} = 5i - 3j + 7k$ and $\vec{M} = -i + 7j - 3k$.
Write each of the following in the term of i, j and k .
*Diberi $\vec{K} = 3i + 2j - 4k$, $\vec{L} = 5i - 3j + 7k$ dan $\vec{M} = -i + 7j - 3k$.
Tulis setiap yang berikut dalam bentuk i, j dan k .*
- i. $\vec{K} + \vec{M}$.
[2 marks]
[2 markah]
- ii. $-2\vec{L} - \vec{M}$.
[2 marks]
[2 markah]
- iii. Vector unit for \vec{L} .
[3 marks]
[3 markah]
- CLO1 (b) Given that vector $\vec{s} = 5i + 3j$, $\vec{t} = -2i - 4j$ and $\vec{u} = 3i + 7j$.
Diberi vektor $\vec{s} = 5i + 3j$, $\vec{t} = -2i - 4j$ dan $\vec{u} = 3i + 7j$.
- i. Compute $2\vec{s} + 3\vec{t} - 5\vec{u}$ in term of i and j .
Hitung $2\vec{s} + 3\vec{t} - 5\vec{u}$ dalam sebutan of i dan j .
[3 marks]
[3 markah]
- ii. Find $\vec{s} + \vec{u}$ by using the Parallelogram method on a graph paper.
Cari $\vec{s} + \vec{u}$ menggunakan kaedah Segiempat Selari di atas kertas graf.
[5 marks]
[5 markah]

- CLO2 (c) Given that $\vec{A} = 6i + 2j - 3k$, $\vec{B} = -2i - 7j + 3k$ and $\vec{C} = -5i + 3j - 5k$.
Calculate:
Diberi $\vec{A} = 6i + 2j - 3k$, $\vec{B} = -2i - 7j + 3k$ dan $\vec{C} = -5i + 3j - 5k$.
Kira:
- i. Vector \vec{AB} and \vec{AC} .
Vektor \vec{AB} dan \vec{AC} .
- [4 marks]
[4 markah]
- ii. $\vec{AB} \times \vec{AC}$.
- [4 marks]
[4 markah]
- iii. Area of parallelogram.
Luas segiempat selari.
- [2 marks]
[2 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM10013)

<p><u>QUADRATIC EQUATION</u></p> <ol style="list-style-type: none"> 1. Quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ 2. Completing the square, $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$ 	<p><u>FORMULA OF TRIANGLE</u></p> <ol style="list-style-type: none"> 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 $= \frac{1}{2}ab \sin C$
<p><u>MATRIX</u></p> <ol style="list-style-type: none"> 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; $x = \frac{ A_1 }{ A }, \quad y = \frac{ A_2 }{ A }, \quad z = \frac{ A_3 }{ A }$ 	<p><u>COMPLEX NUMBER</u></p> <ol style="list-style-type: none"> 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; $z = r(\cos \theta + i \sin \theta)$
<p><u>TRIGONOMETRY</u></p> <p><u>Pythagoras' Theorem</u> <u>Trigonometric Identities</u></p> <div style="display: flex; align-items: center;"> <div style="flex: 1;">  <p style="text-align: center;">$c^2 = a^2 + b^2$</p> </div> <div style="flex: 2;"> $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$ </div> </div>	<p><u>VECTOR & SCALAR</u></p> <ol style="list-style-type: none"> 1. Unit Vector; $\hat{u} = \frac{\vec{u}}{ u }$ 2. Cos θ $= \frac{\vec{A} \cdot \vec{B}}{ A B }$ 3. Scalar Product; $\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$ 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; $\vec{AB} \times \vec{BC}$
<p><u>COMPOUND-ANGLE</u></p> <ol style="list-style-type: none"> 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. $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$ 	<p><u>DOUBLE-ANGLE</u></p> <ol style="list-style-type: none"> 1. $\sin 2A = 2 \sin A \cos A$ 2. $\cos 2A = \cos^2 A - \sin^2 A$ $= 1 - 2 \sin^2 A$ $= 2 \cos^2 A - 1$ 3. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$