

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 II : 2022/2023

DBM10013: ENGINEERING MATHEMATICS 1

TARIKH : 8 JUN 2023

MASA : 8.30 PG - 10.30 PG (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : 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) Express the following expressions in the simplest form:

Ungkapkan semula setiap sebutan berikut dalam bentuk termudah:

i. $(4a^2b - 2a) \div \frac{2ab-1}{ab}$

[3 marks]

[3 markah]

ii. $\frac{x^2-1}{x^2-4} \div \frac{x^2+2x+1}{x^2+4x+4}$

[4 marks]

[4 markah]

CLO1

- b) Solve the quadratic equation below by using quadratic formula method.

Selesaikan persamaan kuadratik di bawah menggunakan kaedah formula kuadratik.

$$2x^2 - 4x + 1 = 0$$

[5 marks]

[5 markah]

CLO2

c) Construct the partial fraction for the following equations:

Bina pecahan separa bagi persamaan yang berikut:

i.
$$\frac{4-3x}{(3-x)(2-3x)}$$

[5 marks]

[5 markah]

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

[8 marks]

[8 markah]

QUESTION 2

SOALAN 2

- CLO1 a) Calculate the complex number below in the form of $a + bi$.
Kirakan nombor kompleks di bawah dalam bentuk $a+bi$.
- i. $(2 + 7i)(8 + 3i)$ [4 marks]
 [4 markah]
- ii. $\frac{6+7i}{8-i}$ [4 marks]
 [4 markah]
- CLO1 b) Calculate the modulus, argument and sketch the Argand Diagram for $7 - 5i$.
Kira modulus, hujah dan lakarkan Rajah Argand untuk $7 - 5i$.
- [7 marks]
 [7 markah]
- CLO2 c) i. Solve the following expression in an exponential form.
Selesaikan ungkapan berikut dalam bentuk eksponen.
- $$\frac{20(\cos 300^\circ + i \sin 300^\circ) \times 4(\cos 20^\circ + i \sin 20^\circ)}{10(\cos 50^\circ + i \sin 50^\circ)}$$
- [6 marks]
 [6 markah]
- ii. Given that $Z_1 = 20(\cos 14^\circ + i \sin 14^\circ)$ and $Z_2 = 40 \angle 125^\circ$. Solve $\frac{Z_2}{Z_1}$ in trigonometric form.
Diberi $Z_1 = 20(\cos 14^\circ + i \sin 14^\circ)$ dan $Z_2 = 40 \angle 125^\circ$. Selesaikan $\frac{Z_2}{Z_1}$ dalam bentuk trigonometrik.
- [4 marks]
 [4 markah]

QUESTION 3

SOALAN 3

CLO1

a) Given matrix $A = \begin{bmatrix} 2 & 10 \\ 5 & 9 \\ 3 & 8 \end{bmatrix}$

Diberi matriks $A = \begin{bmatrix} 2 & 10 \\ 5 & 9 \\ 3 & 8 \end{bmatrix}$

- i. Express the elements of a_{11} , a_{21} and a_{32} .
Nyatakan unsur-unsur a_{11} , a_{21} dan a_{32} .

[3 marks]

[3 markah]

- ii. Convert matrix A to matrix A^T .
Tukarkan matriks A kepada matriks A^T .

[1 mark]

[1 markah]

CLO1

b) Given that matrix $M = \begin{bmatrix} 9 & 7 \\ 4 & 3 \end{bmatrix}$ and $N = \begin{bmatrix} 2 & 5 \\ -7 & 6 \end{bmatrix}$, calculate:
Diberi matriks $M = \begin{bmatrix} 9 & 7 \\ 4 & 3 \end{bmatrix}$ dan $N = \begin{bmatrix} 2 & 5 \\ -7 & 6 \end{bmatrix}$, kira:

- i. $3M + N^T$

[6 marks]

[6 markah]

- ii. M^{-1}

[4 marks]

[4 markah]

- CLO2 c) Given that the following matrix has determinant of -19. Calculate the values of x, y and z for the following equation by using Inverse Matrix Method.
- Diberi bahawa matrix berikut mempunyai penentu -19. Kira nilai x, y and z bagi persamaan berikut dengan menggunakan Kaedah Matrik Songsang.*

$$2x - y + z = 5$$

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

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

[11 marks]

[11 markah]

QUESTION 4

SOALAN 4

- CLO1 a) Given that $\vec{A} = 2i + 7j - 9k$, $\vec{B} = i + 3j - k$ and $\vec{C} = -4i - 3j + 5k$. Write each of the following in the term of i, j and k .

Diberi $\vec{A} = 2i + 7j - 9k$, $\vec{B} = i + 3j - k$ dan $\vec{C} = -4i - 3j + 5k$. Tuliskan setiap yang berikut dalam bentuk i, j and k .

i. $\vec{A} + 2\vec{C}$

[2 marks]

[2 markah]

ii. $-\vec{B} - \vec{C}$

[2 marks]

[2 markah]

iii. Vector unit for $\vec{B}$
Unit vector bagi $\vec{B}$

[3 marks]

[3 markah]

- CLO1 b) Given that vector $\vec{a} = 6i + 3j$, $\vec{b} = 2i - j$ and $\vec{c} = 3i + j$.

Diberi vektor $\vec{a} = 6i + 3j$, $\vec{b} = 2i - j$ dan $\vec{c} = 3i + j$.

i. Compute $2\vec{a} + \vec{b} - 3\vec{c}$ in term of i and j .

Hitung $2\vec{a} + \vec{b} - 3\vec{c}$ dalam sebutan i dan j .

[3 marks]

[3 markah]

- ii. Find $\tilde{a} + \tilde{b}$ by using Parallelogram method on a graph paper. State the answer in (x, y) form.

Cari $\tilde{a} + \tilde{b}$ dengan menggunakan kaedah Segiempat Selari di atas kertas graf. Nyatakan jawapan dalam bentuk (x, y) .

[5 marks]

[5 markah]

- CLO2 c) Given $T = 2i + 3j - 6k$, $U = 3i - 2j - 7k$ and $V = 3i - 5j + 5k$. Calculate:
Diberi $T = 2i + 3j - 6k$, $U = 3i - 2j - 7k$ dan $V = 3i - 5j + 5k$. Kira:

- i. Vector $\overrightarrow{TU}$ and $\overrightarrow{UV}$
Vector $\overrightarrow{TU}$ dan $\overrightarrow{UV}$

[6 marks]

[6 markah]

- ii. $\overrightarrow{TU} \times \overrightarrow{UV}$

[3 marks]

[3 markah]

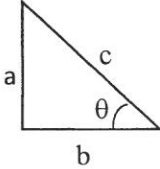
- iii. Area of parallelogram
Luas segiempat selari

[1 mark]

[1 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS 1 (DBM10013)

<u>QUADRATIC EQUATION</u> 1. Quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ 2. Completing the square, $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$	<u>FORMULA OF TRIANGLE</u> 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 $= \frac{1}{2}ab \sin C$
<u>MATRIX</u> 1. Cofactor; $C = (-1)^{i+j} M_{ij}$ 2. Adjoin; $\text{Adj}(A) = C^T$ 3. Inverse of Matrix; $A^{-1} = \frac{1}{ A } \text{Adj}(A)$ 4. Cramer's Rule; $x = \frac{ A_1 }{ A }, y = \frac{ A_2 }{ A }, z = \frac{ A_3 }{ A }$	<u>COMPLEX NUMBER</u> 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; $z = r e^{i\theta}$ 6. Trigonometric Form; $z = r (\cos \theta + i \sin \theta)$
<u>TRIGONOMETRY</u> <u>Pythagoras' Theorem</u> <u>Trigonometric Identities</u>  $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \text{cosec}^2 \theta$ $c^2 = a^2 + b^2$	<u>VECTOR & SCALAR</u> 1. Unit Vector; $\hat{u} = \frac{\vec{u}}{ u }$ 2. Cos θ $= \frac{\vec{A} \cdot \vec{B}}{ \vec{A} \vec{B} }$ 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; $\vec{AB} \times \vec{BC}$
<u>COMPOUND-ANGLE</u> 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. $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$	<u>DOUBLE-ANGLE</u> 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. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$

