

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2022/2023

DBM10013 : ENGINEERING MATHEMATICS 1

TARIKH : 19 DISEMBER 2022

MASA : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.
Struktur (4 soalan)
Dokumen sokongan yang disertakan : Formula & Kertas Graf

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 berstruktur. Jawab semua soalan.

QUESTION 1**SOALAN 1**

CLO1
C2

- (a) Express the following expressions in the simplest form:

Ungkapkan semula setiap sebutan berikut dalam bentuk termudah:

i.
$$\frac{27k^6x^2z^5}{57kx^6z^4}$$

[2 marks]

[2 markah]

ii.
$$\frac{m}{n} \times \frac{n}{m}$$

[2 marks]

[2 markah]

iii.
$$\frac{c+2}{3} \div (c^2 + 2c)$$

[3 marks]

[3 markah]

CLO1
C3

- (b) Solve the quadratic equation below by using completing the square method.

Selesaikan persamaan kuadratik di bawah menggunakan kaedah penyempurnaan kuasa dua.

$$2x^2 + 4x - 3 = 0$$

[5 marks]

[5 markah]

CLO2
C3

- (c) Construct the partial fraction for the following equations:
Bina pecahan separa bagi persamaan yang berikut:

i.
$$\frac{x}{(x+1)(x+2)}$$

[5 marks]

[5 markah]

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

[8 marks]

[8 markah]

QUESTION 2**SOALAN 2**CLO1
C3

- (a) Given
- $R = i + 12$
- ,
- $S = 5i - 2$
- and
- $T = -6 - 7i$
- . Calculate the following:

Diberi $R = i + 12$, $S = 5i - 2$ dan $T = -6 - 7i$. Kira yang berikut:

i. $T + 2R$

[3 marks]

[3 markah]

ii. $\frac{S}{T}$

[4 marks]

[4 markah]

CLO1
C3

- (b) Given
- $K = 9 + 2i$
- and
- $L = -6 + 5i$
- .

Diberi $K = 9 + 2i$ dan $L = -6 + 5i$.

i. Solve $(K - L)$

Selesaikan $(K - L)$

[2 marks]

[2 markah]

ii. Compute the modulus and argument for $(K - L)$

Kira modulus dan hujah bagi $(K - L)$

[3 marks]

[3 markah]

iii. Sketch Argand Diagram for $(K - L)$

Lakarkan Rajah Argand bagi $(K - L)$

[3 marks]

[3 markah]

CLO2
C3

- (c) Solve the following and write the answer in polar form:
Selesaikan yang berikut dan tulis jawapan dalam bentuk kutub:

i. $(2 + 6i) \times (7 \angle 50^\circ)$ [5 marks]

[5 markah]

ii.
$$\frac{2.75e^{1.75i}}{5(\cos 90^\circ + i\sin 90^\circ)}$$

[5 marks]

[5 markah]

QUESTION 3**SOALAN 3**CLO1
C2

- (a) By referring to matrix $R = \begin{pmatrix} 1 & 2 & 4 \\ 4 & 8 & 7 \\ 5 & 9 & 5 \end{pmatrix}$, identify:

Berdasarkan matriks $R = \begin{pmatrix} 1 & 2 & 4 \\ 4 & 8 & 7 \\ 5 & 9 & 5 \end{pmatrix}$, kenalpasti:

- i. The elements of R_{31} and R_{12}

Elemen bagi R_{31} dan R_{12}

[2 marks]

[2 markah]

- ii. R^T

R^T

[2 marks]

[2 markah]

CLO1
C3

- (b) i. Given that $X = \begin{pmatrix} 1 & 4 & 3 \\ 2 & 7 & 3 \end{pmatrix}$, $Y = \begin{pmatrix} 4 & -2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$ and $Z = \begin{pmatrix} 1 & 6 & 5 \\ 0 & -2 & 9 \end{pmatrix}$.

Calculate $4X - 3Y + Z$.

Diberi $X = \begin{pmatrix} 1 & 4 & 3 \\ 2 & 7 & 3 \end{pmatrix}$, $Y = \begin{pmatrix} 4 & -2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$ dan $Z = \begin{pmatrix} 1 & 6 & 5 \\ 0 & -2 & 9 \end{pmatrix}$.

Kira nilai $4X - 3Y + Z$.

[4 marks]

[4 markah]

- ii. Calculate the values of p , q and r in the following matrix equation:

Kira nilai bagi p, q dan r berdasarkan persamaan matrik berikut:

$$3 \begin{pmatrix} p & 1 \\ 2 & 5 \\ 3 & 2 \end{pmatrix} - \begin{pmatrix} 4 & q \\ 1 & 2 \\ 0 & q \end{pmatrix} = \begin{pmatrix} 3 & 4 \\ 5 & 13 \\ 9 & r \end{pmatrix}$$

[6 marks]

[6 markah]

CLO2
C3

(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

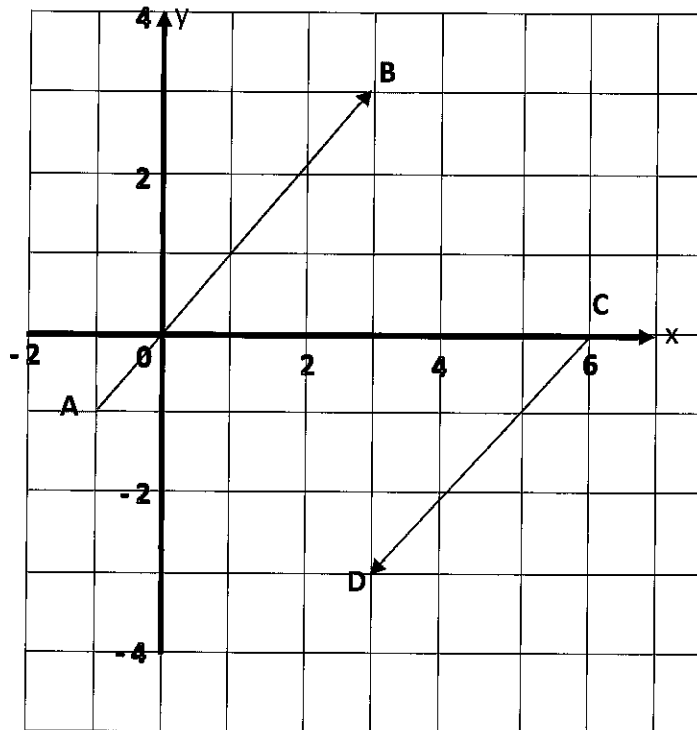


Diagram 4(a) / Rajah 4(a)

- CLO1 (a) The Diagram 4(a) shows the position of vectors in a Cartesian Plane.
C2 *Rajah 4(a) menunjukkan kedudukan vektor di Satah Cartesian.*

- i. Represent the notation of both vectors.
Wakilkan tatatanda untuk kedua-dua vektor.

[2 marks]

[2 markah]

- ii. Express both vectors in (x, y) form.
Ungkapkan kedua-dua vektor dalam bentuk (x, y)

[2 marks]

[2 markah]

- | | |
|------------|---|
| CLO1
C3 | <p>(b) Given coordinates $T(2, 4, -3)$ and $U(5, -2, 3)$. Calculate:
 <i>Diberi koordinat $T(2, 4, -3)$ dan $U(5, -2, 3)$. Kirakan:</i></p> <p>i. Magnitude of TU
 <i>Magnitud TU</i></p> <p style="text-align: right;">[2 marks]
[2 markah]</p> <p>ii. Vector unit for TU
 <i>Unit vektor bagi TU</i></p> <p style="text-align: right;">[1 mark]
[1 markah]</p> |
| CLO1
C3 | <p>(c) Given that vector $\vec{P} = 6i + 2j$, $\vec{Q} = 2i - 5j$ and $\vec{R} = 3i + j$. Compute:
 <i>Diberi vektor $\vec{P} = 6i + 2j$, $\vec{Q} = 2i - 5j$ dan $\vec{R} = 3i + j$. Hitungkan:</i></p> <p>i. $2\vec{P} + \vec{Q} - 3\vec{R}$ in term of i and j.
 <i>$2\vec{P} + \vec{Q} - 3\vec{R}$ dalam sebutan i dan j.</i></p> <p style="text-align: right;">[3 marks]
[3 markah]</p> <p>ii. $\vec{P} + \vec{Q}$ by using Parallelogram method on a graph paper.
 <i>$\vec{P} + \vec{Q}$ menggunakan kaedah Segiempat Selari di atas kertas graf.</i></p> <p style="text-align: right;">[5 marks]
[5 markah]</p> |

CLO2
C3(d) Given $T = 2i - 3j - 6k$, $U = 3i + 5j + 7k$ and $V = 3i - 5j + 5k$.

Calculate:

Diberi $T = 2i - 3j - 6k$, $U = 3i + 5j + 7k$ dan $V = 3i - 5j + 5k$. Kira:

i. $\overrightarrow{TU}$

[1 mark]

[1 markah]

ii. $\overrightarrow{UV}$

[1 mark]

[1 markah]

iii. $\overrightarrow{TU} \cdot \overrightarrow{UV}$

[3 marks]

[3 markah]

iv. $\overrightarrow{TU} \times \overrightarrow{UV}$

[3 marks]

[3 markah]

v. Area of parallelogram

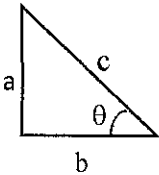
Luas segiempat selari

[2 marks]

[2 markah]

SOALAN TAMAT

FORMULA SHEET FOR DBM10013: ENGINEERING MATHEMATICS 1

<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; $x = \frac{ A_1 }{ A }, \quad y = \frac{ A_2 }{ A }, \quad z = \frac{ A_3 }{ A }$	<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; $z = re^{i\theta}$ 6. Trigonometric Form; $z = r (\cos \theta + i \sin \theta)$
<u>TRIGONOMETRY</u> <u>Pythagoras' Theorem</u>  $c^2 = a^2 + b^2$ <u>Trigonometric Identities</u> $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \text{cosec}^2 \theta$	<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. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$