

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 : 2024/2025

DBM10013 : ENGINEERING MATHEMATICS 1

TARIKH : 16 MEI 2025

MASA : 8.30 PAGI - 10.30 PAGI (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)** questions. Answers **ALL** questions.

ARAHAN:

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

QUESTION 1**SOALAN 1**

- CLO1 a) Express each of the following expressions in the simplest form.

Ungkapkan setiap ungkapan berikut dalam bentuk termudah.

i. $x(y - 2x) + x(y + 3x)$

[3 marks]

[3 markah]

ii. $\frac{x-3}{y} \times \frac{y^2}{x^2-9}$

[4 marks]

[4 markah]

- CLO1 b) Solve the quadratic equation below by using the Quadratic Formula.

Selesaikan persamaan kuadratik berikut dengan menggunakan Formula Kuadratik.

$$2x^2 + 5x = 3$$

[5 marks]

[5 markah]

CLO2 c) Solve the following partial fractions.

Selesaikan pecahan separa berikut.

i.
$$\frac{3x - 4}{x(x + 1)}$$

[5 marks]

[5 markah]

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

[8 marks]

[8 markah]

QUESTION 2**SOALAN 2**

- | | |
|------|--|
| CLO1 | <p>a) Calculate the following complex number in form of $a + bi$.
 <i>Kira nombor kompleks berikut dalam bentuk $a + bi$.</i></p> <p>i. $3(-3 - 2i) + 2(2 - i)$ [3 marks]
 [3 markah]</p> <p>ii. $\frac{4 - 2i}{1 - 3i}$ [5 marks]
 [5 markah]</p> |
| CLO1 | <p>b) Find modulus, argument and sketch Argand Diagram for $4 - 3i$.
 <i>Cari modulus, hujah dan lakarkan Rajah Argand bagi $4 - 3i$.</i></p> <p style="text-align: right;">[7 marks]
[7 markah]</p> |
| | <p>c) Given that $p = 4(\cos 20^\circ + i \sin 20^\circ)$ and $q = 8\angle 40^\circ$.
 <i>Diberi $p = 4(\cos 20^\circ + i \sin 20^\circ)$ dan $q = 8\angle 40^\circ$.</i></p> |
| CLO2 | <p>i. Change p and q into exponential form.
 <i>Tukar p dan q dalam bentuk eksponen.</i></p> <p style="text-align: right;">[4 marks]
[4 markah]</p> |
| CLO2 | <p>ii. Calculate $p \times q$ and $\frac{q}{p}$ in trigonometric form.
 <i>Kira $p \times q$ dan $\frac{q}{p}$ dalam bentuk trigonometri.</i></p> <p style="text-align: right;">[6 marks]
[6 markah]</p> |

QUESTION 3**SOALAN 3**

CLO1

a) Given $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 9 & 10 \\ 3 & -1 & 5 \end{bmatrix}$, express:

Diberi $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \\ 3 & 4 \end{bmatrix}$ dan $B = \begin{bmatrix} 2 & 9 & 10 \\ 3 & -1 & 5 \end{bmatrix}$, nyatakan:

- i. the order of matrix A and B
peringkat bagi matrik A dan B

[2 marks]

[2 markah]

- ii. A^T and B^T
 A^T dan B^T

[2 marks]

[2 markah]

CLO1

b) Calculate:

Kira:

- i. $2 \begin{pmatrix} 1 & 4 & 5 \\ 2 & 3 & 2 \end{pmatrix} + 3 \begin{pmatrix} 1 & -1 & 4 \\ 3 & 5 & 2 \end{pmatrix}$

[4 marks]

[4 markah]

- ii. values of p , q and r if given $\begin{pmatrix} 3 & p & 2 \\ 1 & -1 & 4 \end{pmatrix} \begin{pmatrix} 2 & q \\ 1 & 3 \\ 5 & 2 \end{pmatrix} = \begin{pmatrix} 16 & -2 \\ r & 3 \end{pmatrix}$

nilai p , q dan r jika diberi $\begin{pmatrix} 3 & p & 2 \\ 1 & -1 & 4 \end{pmatrix} \begin{pmatrix} 2 & q \\ 1 & 3 \\ 5 & 2 \end{pmatrix} = \begin{pmatrix} 16 & -2 \\ r & 3 \end{pmatrix}$

[6 marks]

[6 markah]

- CLO2 c) Solve the following equation by using the Cramer's Rule.
Selesaikan persamaan berikut dengan menggunakan Petua Cramer.

$$x + y + 2z = 9$$

$$2x + 4y - 3z = 1$$

$$3x + 6y - 5z = 0$$

[11 marks]

[11 markah]

QUESTION 4**SOALAN 4**

CLO1

- a) Given $A = 10i - 2j$ and $B = 4i + 6j$, find:
Diberi $A = 10i - 2j$ dan $B = 4i + 6j$, cari:

- i. vector $\overrightarrow{AB}$
vektor $\overrightarrow{AB}$

[3 marks]

[3 markah]

- ii. magnitude of vector $\overrightarrow{AB}$
magnitude bagi vektor $\overrightarrow{AB}$

[2 marks]

[2 markah]

- iii. unit vector of vector $\overrightarrow{AB}$
vektor unit bagi vektor $\overrightarrow{AB}$

[2 marks]

[2 markah]

CLO1

- b) Given $\vec{F} = 2i - 5j$ and $\vec{G} = 3i + j$, find:
Diberi $\vec{F} = 2i - 5j$ dan $\vec{G} = 3i + j$, cari:

- i. $\vec{F} + \vec{G}$ by using Parallelogram method on graph paper.
 $\vec{F} + \vec{G}$ dengan menggunakan kaedah Segiempat Selari pada kertas graf.

[4 marks]

[4 markah]

- ii. $\vec{G} - \vec{F}$ by using Triangle Construction method on graph paper.
 $\vec{G} - \vec{F}$ dengan menggunakan kaedah Pembinaan Segi Tiga pada kertas graf.
- [4 marks]
[4 markah]
- CLO2 c) JKL is a triangle with vertices $J (2,0, -2)$, $K (5, -2,3)$, and $L (0,5,4)$, calculate:
 JKL adalah satu segi tiga dengan bucu $J (2,0, -2)$, $K (5, -2,3)$, dan $L (0,5,4)$, kira:
- i. $JK \cdot KL$
- [5 marks]
[5 markah]
- ii. $JK \times KL$
- [3 marks]
[3 markah]
- iii. the area of parallelogram based on answer in c) ii
luas segiempat selari berdasarkan jawapan di c) ii
- [2 marks]
[2 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS 1 (DBM10013)

QUADRATIC EQUATION

1. **Quadratic formula**, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. **Completing the square**,

$$\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$$

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** $= \frac{1}{2}ab \sin C$

MATRIX

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**;

$$x = \frac{|A_1|}{|A|}, \quad y = \frac{|A_2|}{|A|}, \quad z = \frac{|A_3|}{|A|}$$

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**; $z = a + bi$

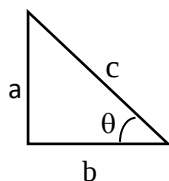
4. **Polar Form**; $z = r \angle \theta$

5. **Exponential Form**; $z = re^{i\theta}$

6. **Trigonometric Form**; $z = r (\cos \theta + i \sin \theta)$

TRIGONOMETRY

Pythagoras' Theorem



$$c^2 = a^2 + b^2$$

Trigonometric Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cos^2 \theta + \sin^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

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

VECTOR & SCALAR

1. **Unit Vector**; $\hat{u} = \frac{\vec{u}}{|\vec{u}|}$

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**;

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

5. **Area of parallelogram ABC**;

$$|\vec{AB} \times \vec{BC}|$$

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. $\cos 2A = \cos^2 A - \sin^2 A$

$$= 1 - 2\sin^2 A$$

$$= 2\cos^2 A - 1$$

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