

**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**

**DBM10163 : ENGINEERING MATHEMATICS 1**

**TARIKH : 16 MEI 2025**

**MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)**

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

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf dan Formula

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**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

- (a) i. Simplify the expression:  
*Permudahkan ungkapan berikut:*

$$\frac{4x^2 + 16x}{2x^2 + 5x - 12} \div \frac{4x}{2x - 3}$$

[4 marks]

[4 markah]

CLO2

- ii. Solve,  $3x^2 - 9 = -6x$  by using completing the square method.  
*Selesaikan,  $3x^2 - 9 = -6x$  dengan menggunakan kaedah penyempurnaan kuasa dua.*

[6 marks]

[6 markah]

CLO2

- (b) Solve the partial fraction.  
*Selesaikan pecahan separa berikut.*

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

[7 marks]

[7 markah]

CLO1

(c) Referring to Diagram 1 (c), ABC is a straight line, calculate:

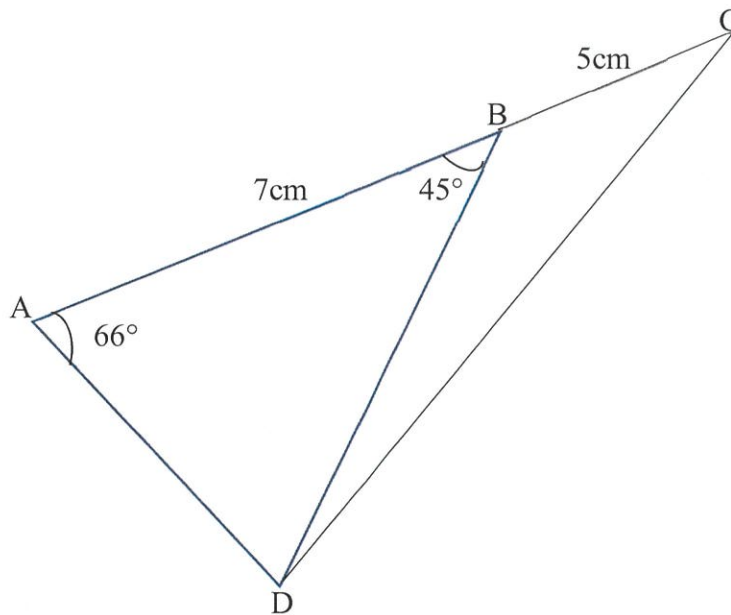
*Merujuk Rajah 1 (c), ABC adalah garis lurus, hitung:*

Diagram 1 (c) / Rajah 1 (c)

i. Length of AD

[3 marks]

[3 markah]

ii. Length of CD

[5 marks]

[5 markah]

**QUESTION 2****SOALAN 2**

- CLO1 (a) Given that  $P = 6i + 2$ ,  $Q = -5 + 8i$  and  $R = 3 + 4i$ . Express the following;  
*Diberi  $P = 6i + 2$ ,  $Q = -5 + 8i$  dan  $R = 3 + 4i$ . Ungkapkan yang berikut:*
- i.  $2P + Q$
- [3 marks]  
[3 markah]
- ii.  $\frac{P}{R}$
- [4 marks]  
[4 markah]
- CLO2 (b) Draw the Argand Diagram for complex number,  $3 - 3i$  using graph paper. Then, show the modulus and argument from the diagram.  
*Lukis rajah Argand bagi nombor kompleks,  $3 - 3i$  menggunakan kertas graf. Kemudian, tunjukkan modulus dan argumen daripada rajah.*
- [6 marks]  
[6 markah]
- CLO2 (c) i. Solve the following expression in an exponential form.  
*Selesaikan ungkapan berikut dalam bentuk eksponen.*
- $$\frac{10 (\cos 200^\circ + i \sin 200^\circ) \times 6 (\cos 10^\circ + i \sin 10^\circ)}{20 (\cos 70^\circ + i \sin 70^\circ)}$$
- [6 marks]  
[6 markah]

- ii. Given that  $Z_1 = 10(\cos 12^\circ + i \sin 12^\circ)$  and  $Z_2 = 20 \angle 125^\circ$ .

Solve  $\frac{Z_2}{Z_1}$  in trigonometric form.

*Diberi  $Z_1 = 10(\cos 12^\circ + i \sin 12^\circ)$  dan  $Z_2 = 20 \angle 125^\circ$ .*

*Selesaikan  $\frac{Z_2}{Z_1}$  dalam bentuk trigonometrik.*

[6 marks]

[6 markah]

**QUESTION 3****SOALAN 3**

CLO1

(a) Given  $P = \begin{pmatrix} 1 & -2 & -1 \\ 2 & -4 & -6 \\ 0 & 7 & 3 \end{pmatrix}$ ,  $Q = \begin{pmatrix} 2 & 0 & 6 \\ 4 & 7 & 8 \\ 2 & 5 & 1 \end{pmatrix}$  and  $R = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 4 & 6 \\ 0 & 2 & 0 \end{pmatrix}$ .

Diberi  $P = \begin{pmatrix} 1 & -2 & -1 \\ 2 & -4 & -6 \\ 0 & 7 & 3 \end{pmatrix}$ ,  $Q = \begin{pmatrix} 2 & 0 & 6 \\ 4 & 7 & 8 \\ 2 & 5 & 1 \end{pmatrix}$  dan  $R = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 4 & 6 \\ 0 & 2 & 0 \end{pmatrix}$ .

Indicate:

*Tunjukkan:*

i. The element at  $P_{22}, P_{33}, Q_{11}, R_{31}$

*Unsur pada  $P_{22}, P_{33}, Q_{11}, R_{31}$*

[4 marks]

[4 markah]

ii.  $Q + R - P$

[5 marks]

[5 markah]

CLO2

(b) Given that  $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ ,  $B = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$  and  $|AB| = -5$ , compute  $(AB)^{-1}$

Diberi  $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ ,  $B = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$  dan  $|AB| = -5$ , kirakan  $(AB)^{-1}$

[5 marks]

[5 markah]

CLO2

(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**

- CLO1 (a) Given point  $A(1, 2, 3)$  and  $B(4, -1, 5)$ .  
*Diberi titik  $A(1, 2, 3)$  dan  $B(4, -1, 5)$ .*
- i. Indicate the magnitude of  $\overrightarrow{AB}$ .  
*Tunjukkan magnitud bagi  $\overrightarrow{AB}$ .*
- [5 Marks]  
 [5 Markah]
- ii. Represent vector  $\vec{A} + \vec{B}$  graph using Parallelogram method.  
*Tunjukkan vector  $\vec{A} + \vec{B}$  graf menggunakan kaedah Segiempat Selari.*
- [5 Marks]  
 [5 Markah]
- CLO2 (b) Given that  $\vec{A} = i + 2j + 3k$ ,  $\vec{B} = 4i - j + 2k$  and  $\vec{C} = 2i + 3j - k$ .  
 Calculate:  
*Diberi  $\vec{A} = i + 2j + 3k$ ,  $\vec{B} = 4i - j + 2k$  dan  $\vec{C} = 2i + 3j - k$ . Kira:*
- i. Angle between vector  $\vec{A}$  and  $\vec{B}$ .  
*Sudut antara vektor  $\vec{A}$  dan  $\vec{B}$*
- [6 Marks]  
 [6 Markah]
- ii. Area of triangle  $ABC$ .  
*Luas segitiga  $ABC$ .*
- [9 Marks]  
 [9 Markah]

**SOALAN TAMAT**

# FORMULA SHEET FOR ENGINEERING MATHEMATICS 1 (DBM10163)

## QUADRATIC EQUATION

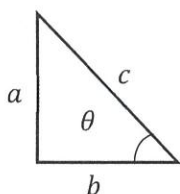
1. Quadratic formula,  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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

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

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

## 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,  $z = r(\cos \theta + i \sin \theta)$
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,  $\operatorname{Adj}(A) = C^T$
3. Inverse of Matrix,  $A^{-1} = \frac{1}{|A|} \operatorname{Adj}(A)$
4. Cramer's Rule,

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

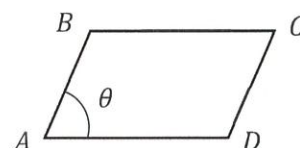
## VECTOR AND SCALAR

1. Unit Vector,  $\hat{u} = \frac{\vec{u}}{|u|}$
2.  $\cos \theta = \frac{\vec{A} \cdot \vec{B}}{|A||B|}$
3. Scalar (dot) Product,  
$$\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$$
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

$$A = |\vec{AB} \times \vec{AD}|$$



6. Area of triangle ABC

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

