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 I : 2024/2025

DBM10013: ENGINEERING MATHEMATICS 1

TARIKH : 6 DISEMBER 2024
MASA : 8.30 PG – 10.30 PG (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf dan Kertas Formula

---

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answers **ALL** questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 (a) Express each of the following expression in the simplest form:

Ungkapkan yang berikut dalam bentuk yang termudah:

i. $\dfrac{3p(2q^2r^4)}{2pr^2}$

[3 marks]

[*3 markah*]

ii. $\dfrac{(y^2-4)}{3y} \div \dfrac{(y-2)}{6y}$

[4 marks]

[*4 markah*]

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

Selesaikan persamaan kuadratik berikut menggunakan Kaedah Formula Kuadratik

$$x^2 + 4x - 12 = 0$$

[5 marks]

[*5 markah*]

CLO2 (c) Solve each of the following partial fractions:

Selesaikan setiap pecahan separa berikut:

i. $\dfrac{3x}{(x+1)(x-2)}$

[6 marks]

[6 *markah*]

ii. $\dfrac{5x+4}{(x+2)\,x^2}$

[7 marks]

[7 *markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Given that $R = 2 + 6\text{i}$, $S = -8 + 5i$ and $T = -7 - 3i$. Calculate each of the following in the form of $a + \text{b}i$.

Diberi $R = 2 + 6i$, $S = -8 + 5i$ *dan* $T = -7 - 3i$. *Kirakan setiap yang berikut dalam bentuk* $a + bi$.

i. $T - S + 2R$

[3 marks]

[*3 markah*]

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

[5 marks]

[*5 markah*]

CLO1 (b) Calculate the modulus, argument and sketch the Argand Diagram for $M = -9 + i$.

Hitungkan modulus, hujah dan lakarkan Gambarajah Argand bagi $M = -9 + i$.

[7 marks]

[7 *markah*]

CLO2

(c) i. Solve $\frac{Z_1}{Z_2}$ in trigonometric form given that $\mathbf{z_1} = 60 \angle 135°$ and $\mathbf{z_2} = 2\,(\cos 15° + i \sin 15°)$.

Selesaikan $\frac{Z_1}{Z_2}$ *dalam bentuk trigonometri diberi* $\mathbf{z_1} = 60 \angle 135°$ *dan* $\mathbf{z_2} = 2\,(\cos 15° + i \sin 15°)$.

[4 marks]

[*4 markah*]

ii. Solve the following expression in exponential form.

Selesaikan ungkapan berikut dalam bentuk eksponen.

$$\frac{15\,(\cos 100° + i \sin 100°) \times 8\,(\cos 10° + i \sin 10°)}{2\,(\cos 15° + i \sin 15°)}$$

[6 marks]

[*6 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) Referring to matrix B $= \begin{bmatrix} 6 & -5 & 3 \\ -3 & 7 & 1 \end{bmatrix}$,

Merujuk kepada matriks B $= \begin{bmatrix} 6 & -5 & 3 \\ -3 & 7 & 1 \end{bmatrix}$,

i. Identify the element at B_{12} and B_{21}

Tentukan unsur pada B_{12} dan B_{21}

[2 marks]

[*2 markah*]

ii. Express B^T

Ungkapkan B^T

[2 marks]

[*2 markah*]

CLO1 (b) Given matrix K $= \begin{bmatrix} 3 & -2 \\ -6 & 4 \end{bmatrix}$, L $= \begin{bmatrix} 3 & -2 \\ -6 & 4 \end{bmatrix}$ and M $= \begin{bmatrix} 10 & -4 \\ 8 & 6 \end{bmatrix}$, calculate:

Diberi matriks $K = \begin{bmatrix} 3 & -2 \\ -6 & 4 \end{bmatrix}$, $L = \begin{bmatrix} 3 & -2 \\ -6 & 4 \end{bmatrix}$ *and* $M = \begin{bmatrix} 10 & -4 \\ 8 & 6 \end{bmatrix}$, *kira:*

i. $2K + \frac{1}{2}M$

[5 marks]

[*5 markah*]

ii. $L^2 - 3L$

[5 marks]

[*5 markah*]

CLO2

(c) Solve the following simultaneous equations by using Cramer's Rule:

Selesaikan persamaan serentak berikut menggunakan Petua Cramer:

$$2x + y + 2z = 9$$
$$2x + 4y - 3z = 1$$
$$3x + 6y - 5z = 0$$

[11 marks]

[*11 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Given that $\vec{R} = 3i - 8j + 5k$, $\vec{S} = 5i - 2j + 8k$ and $\vec{T} = 9i + 5j - 6k$. Solve each of the following in terms of i , j and k.

Diberi $\vec{R} = 3i - 8j + 5k$, $\vec{S} = 5i - 2j + 8k$ *dan* $\vec{T} = 9i + 5j - 6k$. *Selesaikan setiap yang berikut dalam bentuk* i , j *dan* k.

i. $3\vec{S}$

[2 marks]

[2 *markah*]

ii. $-\vec{R}$

[2 marks]

[2 *markah*]

iii. A unit vector parallel to $\vec{T}$

Vektor unit selari bagi $\vec{T}$

[3 marks]

[3 *markah*]

CLO1 (b) Given that the position vectors $\vec{u}$ = (4,1) and $\vec{v}$ = (-3,2).

Diberi vector-vektor posisi $\vec{u}$ = *(4,1) and* $\vec{v}$ = *(-3,2).*

i. Calculate $\vec{u} - \vec{v}$

Kira $\vec{u} - \vec{v}$

[3 marks]

[*3 markah*]

ii. Draw $\vec{u} - \vec{v}$ by using the Parallelogram Method on a graph paper.

Lukis $\vec{u} - \vec{v}$ *menggunakan Kaedah segiempat selari di atas kertas graf.*

[5 marks]

[*5 markah*]

CLO2

(c) Given vector $\vec{A} = 3i + 2j - 4k$ and vector $\vec{B} = 8i - 6j + 2k$. Calculate:

Diberi vektor $\vec{A} = 3i + 2j - 4k$ *dan vektor* $\vec{B} = 8i - 6j + 2k$. *Hitung:*

i. $\vec{B} \cdot \vec{A}$

[2 marks]

[2 *markah*]

ii. $\vec{A} \times \vec{B}$

[3 marks]

[*3 markah*]

iii. The angle between vector $\vec{A}$ and vector $\vec{B}$

Sudut di antara vektor $\vec{A}$ *dan vektor* $\vec{B}$

[5 marks]

[5 *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;*** $\mathbf{a^2 = b^2 + c^2 - 2bc \cos A}$
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;***

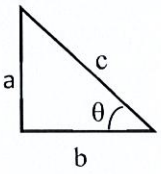
$$x = \frac{|A_1|}{|A|}, \quad y = \frac{|A_2|}{|A|}, \quad z = \frac{|A_3|}{|A|}$$

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;*** $z = r\,(\cos\theta + \mathrm{i}\sin\theta)$

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

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

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

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

$$1 + cot^2\theta = cosec^2\theta$$

VECTOR & SCALAR

1. ***Unit Vector;*** $\hat{u} = \frac{\bar{u}}{|u|}$
2. ***Cos θ*** $= \frac{\bar{A} \bullet \bar{B}}{|A||B|}$
3. ***Scalar Product;***

$$\vec{A} \bullet \vec{B} = a_1a_2 + b_1b_2 + c_1c_2$$

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;***

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

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

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

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

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