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 : 2025/2026

DBM10163: ENGINEERING MATHEMATICS 1

TARIKH : 04 MEI 2026
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

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

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf dan Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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:

$$\frac{x^2-9}{x^2-2x-15} \div \frac{5x+15}{x-5}$$

[4 marks]

[*4 markah*]

CLO1 ii. Solve $2x^2 - 3 = 5x$ by using the Quadratic Formula Method.

Selesaikan $2x^2 - 3 = 5x$ *dengan menggunakan Kaedah Rumus Kuadratik.*

[6 marks]

[*6 markah*]

CLO2 (b) Solve the following partial fraction.

Selesaikan pecahan separa berikut.

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

[7 marks]

[*7 markah*]

CLO1

(c) Based on Figure 1, $\angle QPR = 50°$, calculate:

Berdasarkan Rajah 1, $\angle QPR = 50°$, *kira:*

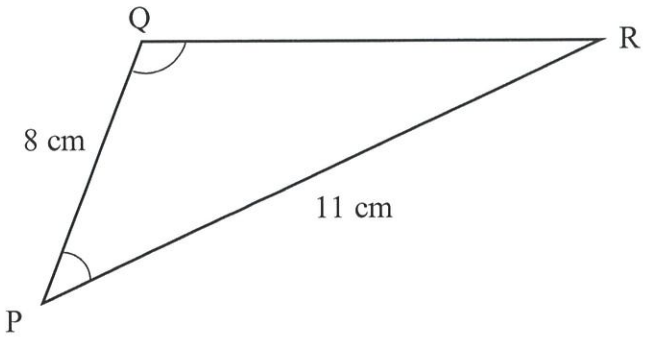


Figure 1/ *Rajah 1*

i. the length of QR

panjang QR

[4 marks]

[*4 markah*]

ii. the angle of $\angle PQR$

sudut $\angle PQR$

[4 marks]

[*4 markah*]

QUESTION 2

SOALAN 2

CLO2 (a) Given $J = 5 + 3i$, $K = -2 + 4i$, and $L = 1 - 6i$. Express the following:
Diberi $J = 5 + 3i$, $K = -2 + 4i$, *and* $L = 1 - 6i$. *Ungkapkan yang berikut:*

i. $2J - K$

[3 marks]
[3 *markah*]

ii. JL

[4 marks]
[*4 markah*]

CLO2 (b) Calculate the modulus and argument then draw the Argand diagram for $P = -30 + 18i$ on the graph paper.
Kira modulus dan argumen seterusnya lukis rajah Argand bagi $P = -30 + 18i$ *dalam kertas graf.*

[6 marks]
[*6 markah*]

CLO2 (c) i. Solve the following expression in the Cartesian form.
Selesaikan ungkapan berikut dalam bentuk Cartesian.

$$\frac{8\angle 210°}{2(cos\ 45° + i \sin 45°)}$$

[4 marks]
[*4 markah*]

ii. Given $Z_1 = -3 + 3i$, $Z_2 = 4(\cos 120° + i \sin 120°)$ and $Z_3 = 2\angle 30$. Solve $\frac{Z_1 Z_2}{Z_3}$ in the Polar Form.

Diberi $Z_1 = -3 + 3i$, $Z_2 = 4(cos\, 120° + i\, sin\, 120°)$ *dan* $Z_3 = 2\angle 30°$. *Selesaikan* $\frac{Z_1 Z_2}{Z_3}$ *dalam bentuk Polar.*

[8 marks]

[*8 markah*]

QUESTION 3

SOALAN 3

CLO1

(a) Given the matrices $A = \begin{bmatrix} 3 & -1 & 4 \\ 0 & 2 & 5 \\ -2 & 1 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 2 \\ -3 & 4 & 1 \\ 5 & -2 & 0 \end{bmatrix}$, and $C = \begin{bmatrix} 2 & 1 & -1 \\ 4 & 0 & 3 \\ 1 & 5 & 2 \end{bmatrix}$.

Diberi matriks $A = \begin{bmatrix} 3 & -1 & 4 \\ 0 & 2 & 5 \\ -2 & 1 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 2 \\ -3 & 4 & 1 \\ 5 & -2 & 0 \end{bmatrix}$, *dan* $C = \begin{bmatrix} 2 & 1 & -1 \\ 4 & 0 & 3 \\ 1 & 5 & 2 \end{bmatrix}$.

Indicate :

Tunjukkan :

i. the element at $A_{23}, B_{32}, B_{22},$ and C_{31}.

elemen pada $A_{23}, B_{32}, B_{22},$ *and* C_{31}.

[4 marks]

[*4 markah*]

ii. $A - C + B$

[5 marks]

[5 *markah*]

CLO2

(b) Given $M = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}, N = \begin{bmatrix} 1 & 2 \\ -2 & 5 \end{bmatrix}$ and $|MN| = 99$. Calculate $(MN)^{-1}$.

Diberi $M = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}, N = \begin{bmatrix} 1 & 2 \\ -2 & 5 \end{bmatrix}$ *dan* $|MN| = 99$. *Kira* $(MN)^{-1}$.

[5 marks]

[*5 markah*]

CLO2

(c) Given the determinant |A| = 7. Calculate the following equations using the Inverse Matrix Method to determine the values of x, y and z.

Diberi penentu |A| = 7. Kira persamaan berikut dengan menggunakan Kaedah Matrik Songsang untuk menentukan nilai x, y dan z.

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

[11 marks]

[*11 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Given $\vec{A} = 2i - 3j, \vec{B} = 4i + 5j$ and $\vec{C} = -i + 2j$.

Diberi $\vec{A} = 2i - 3j, \vec{B} = 4i + 5j$ *dan* $\vec{C} = -i + 2j$.

i. Express the unit vector of $\vec{A} + \vec{B}$.

Ungkapkan vektor unit $\vec{A} + \vec{B}$.

[5 marks]

[*5 markah*]

ii. Represent vector $\vec{B} + \vec{C}$ using the Parallelogram Method on the graph paper.

Gambarkan vektor $\vec{B} + \vec{C}$ *menggunakan Kaedah Segiempat Selari di atas kertas graf.*

[5 marks]

[*5 markah*]

CLO2 (b) Given $\vec{P} = 2i - j + 2k, \vec{Q} = 3i + 2j - k$ and $\vec{R} = i + 4j + k$. Calculate :

Diberi $\vec{P} = 2i - j + 2k, \vec{Q} = 3i + 2j - k$ *dan* $\vec{R} = i + 4j + k$. *Kira :*

i. the angle between vectors $\vec{P}$ *and* $\vec{Q}$.

sudut antara vektor $\vec{P}$ *dan* $\vec{Q}$.

[9 marks]

[*9 markah*]

ii. the area of the parallelogram formed by vectors $\overrightarrow{PQ}$ *and* $\overrightarrow{PR}$.

luas segiempat selari yang dibentuk oleh vektor $\overrightarrow{PQ}$ *dan* $\overrightarrow{PR}$.

[6 marks]

[*6 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,***

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

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;***

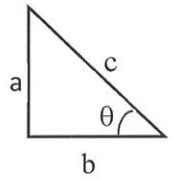
$$x = \frac{|A_1|}{|A|}, y = \frac{|A_2|}{|A|}, z = \frac{|A_3|}{|A|}$$

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 Identitie

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

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

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

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

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;***

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

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