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 DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2025/2026

BBM10123: MATHEMATICS FOR ENGINEERING TECHNOLOGY

TARIKH : 28 JANUARI 2026
MASA : 9.00 PAGI – 12.00 TENGAH HARI (3 JAM)

Kertas ini mengandungi **TUJUH (7)** 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)

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) Simplify the following complex number and write in the form of $a + bi$.
Permudahkan nombor kompleks berikut dan tulis dalam bentuk $a + bi$.

$$\frac{(5-2i)^2}{-2+4i}$$

[4 marks]
[4 *markah*]

CLO1

(b) Given that $z_1 = 5 + 3i$ and $z_2 = -1 - i$. Calculate the modulus and argument for the following.
Diberikan $z_1 = 5 + 3i$ *dan* $z_2 = -1 - i$. *Kirakan modulus dan hujah bagi yang berikut.*

i) $z_2 + 5i$

[5 marks]
[*5 markah*]

ii) $z_1 z_2 + 15i$

[5 marks]
[5 *markah*]

CLO2

(c) Given that $z_1 = 5 + 3i$, $z_2 = 3(\cos 67° + i \sin 67°)$ and $z_3 = 5\angle 233°$. Calculate the following and write the answer in form provided in the bracket.

Diberikan $z_1 = 5 + 3i$, $z_2 = 3(cos\, 67° + i\, sin\, 67°)$ *dan* $z_3 = 5\angle 233°$. *Kirakan yang berikut dan berikan jawapan dalam bentuk yang dinyatakan dalam kurungan*.

i) $z_1 z_3$ (polar form)

[5 marks]

[*5 markah*]

ii) $\frac{z_3 + z_1}{z_2}$ (exponential form)

[6 marks]

[*6 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Given $f(x) = (x-2)(x+1)$, by using graphical method, determine whether the function is one-to-one or not for $x \geq 2$.

Diberi $f(x) = (x-2)(x+1)$ *,dengan menggunakan kaedah graf, tentukan samada fungsi adalah satu ke satu atau tidak bagi* $x \geq 2$.

[4 marks]

[4 *markah*]

CLO1 (b) Given $(g \circ f)(x) = (2x-3)^2$, and $f(x) = 2x + 15$.

Diberi $(g \circ f)(x) = (2x-3)^2$, *dan* $f(x) = 2x + 15$

i) Calculate the value of $f^2(x+3)$

Kirakan nilai bagi $f^2(x+3)$

[4 marks]

[4 markah]

ii) Calculate $g(x)$

Kirakan nilai $g(x)$

[5 marks]

[5 markah]

CLO2 (c) Given functions $f(x) = (3x+1)$ and $g(x) = \frac{2}{3x+2}$.

Diberikan fungsi $f(x) = (3x+1)$ *dan* $g(x) = \frac{2}{3x+2}$

i) Calculate $g^{-1}(2)$

Kirakan $g^{-1}(2)$

[5 marks]

[5 markah]

ii) Compute $(g \circ f)^{-1}(7)$

Kirakan $(g \circ f)^{-1}(7)$

[7 marks]

[7 markah]

QUESTION 3

SOALAN 3

CLO1 (a) Given that $\sin\theta = \frac{6}{13}$, where $90 \leq \theta \leq 180°$. Use Pythagoras Theorem to express the value of $2sec\theta \tan\theta$.

Diberikan $sin\,\theta = \frac{6}{13}$, *dimana* $90° \leq \theta \leq 180°$. *Gunakan Teorem Pythagoras untuk menunjukkan nilai bagi* $2sec\theta\, tan\,\theta$.

[4 marks]

[4 markah]

CLO1 (b) Solve the following equations for $0° \leq \theta \leq 360°$

Selesaikan persamaan berikut bagi nilai $0° \leq \theta \leq 360°$

i) $3\sin\theta = -2$

[4 marks]

[4 markah]

ii) $5\cos 2\theta - 6\cos\theta = 5\cos\theta - 8$

[5 marks]

[5 markah]

CLO2 (c) Figure 3(c) shows that $PQ = 10\ cm, PR = 6.8\ cm, RS = 7.8\ cm,\ \angle QPR = 20°$, $\angle PSQ = 50°$ and QRS is a straight line. Calculate the following:

Rajah 3(c) menunjukkan bahawa $PQ = 10\ cm, PR = 6.8\ cm, RS = 7.8\ cm,$ $\angle QPR = 20°$, $\angle PSQ = 50°$ *dan* QRS *adalah garis lurus. Kira nilai berikut:*

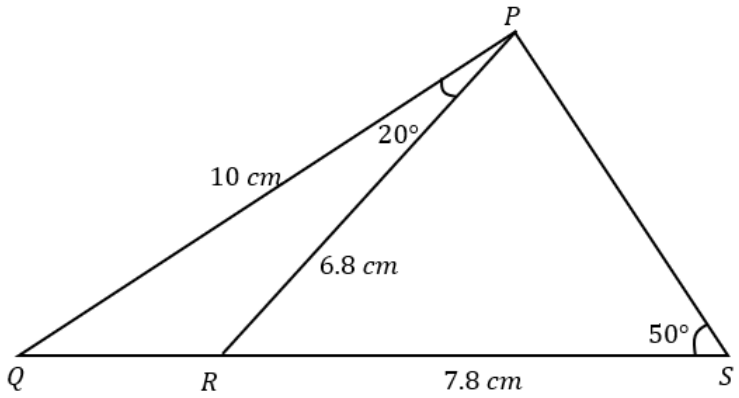


Diagram (3c)/ *Rajah (3c)*

i) The length of QS

Panjang QS

[5 marks]

[5 markah]

ii) The area of triangle PQS

Luas segitiga PQS

[7 marks]

[7 markah]

QUESTION 4

SOALAN 4

CLO1 (a) Given that $\overline{a} = 2i - 3j + 5k$, $\overline{b} = 5i + 4j - 2k$ and $\overline{c} = -2i - j + 5k$. Compute each of the following.

Diberikan $\overline{a} = 2i - 3j + 5k$, $\overline{b} = 5i + 4j - 2k$ *dan* $\overline{c} = -2i - j + 5k$. *Kirakan yang berikut.*

i) $-\overline{a} - 2\,\overline{b}$

[3 marks]

[3 markah]

ii) $5\overline{c} + 3\overline{b}$

[3 marks]

[3 markah]

iii) Unit vector of $\overline{a} + 2\,\overline{c}$
Unit vector bagi $\overline{a} + 2\,\overline{c}$

[4 marks]

[4 markah]

CLO2 (b) Given that $\overline{OA} = 5i - 14j + 5k$ and $\overline{OB} = 20i + 7j - 3k$. Calculate.

Diberi bahawa $\overline{OA} = 5i - 14j + 5k$ *dan* $\overline{OB} = 20i + 7j - 3k$. *Kirakan.*

i) $\left|\overline{AB}\right|$

[4 marks]

[4 markah]

ii) $\overline{OA} \times \overline{OB}$

[5 marks]

[5 markah]

iii) Angle between $\overline{OA}$ and $\overline{OB}$
Sudut diantara $\overline{OA}$ *dan* $\overline{OB}$

[6 marks]

[6 markah]

SOALAN TAMAT

FORMULA SHEET FOR MATHEMATICS FOR ENGINEERING TECHNOLOGY

REAL AND COMPLEX NUMBER SYSTEM

1. ***Modulus of*** $\boldsymbol{z} = \sqrt{a^2 + b^2}$
2. ***Argument of*** $\boldsymbol{z} = tan^{-1}\left(\frac{b}{a}\right)$
3. ***Cartesian Form***; $\boldsymbol{z} = a + bi$
4. ***Polar Form***; $\boldsymbol{z} = r\angle\theta$
5. ***Exponential Form***; $\boldsymbol{z} = re^{i\theta}$
6. ***Trigonometric Form***; $\boldsymbol{z} = r\,(\cos\theta + \mathrm{i}\sin\theta)$

FORMULA OF TRIANGLE

1. ***Sine Rules;*** $\dfrac{\boldsymbol{a}}{\sin\ \boldsymbol{A}} = \dfrac{\boldsymbol{b}}{\sin\ \boldsymbol{B}} = \dfrac{\boldsymbol{c}}{\sin\ \boldsymbol{C}}$
2. ***Cosine Rules;*** $\mathbf{a^2 = b^2 + c^2 - 2bc\cos A}$
3. ***Area of Triangle*** $= \frac{1}{2}\boldsymbol{ab}\sin\boldsymbol{C}$

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;***

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

COMPOUND-ANGLE

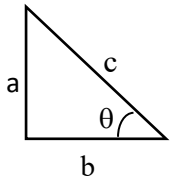
1. $sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$
2. $cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$
3. $tan(A \pm B) = \frac{tan\ A \pm\ tan\ B}{1 \mp \tan A\tan B}$

DOUBLE-ANGLE

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

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

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

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

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

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

VECTOR ALGEBRA

1. ***Unit Vector***; $\hat{u} = \frac{\bar{u}}{|u|}$
2. ***Cos*** $\boldsymbol{\theta}$ $= \dfrac{\bar{A} \bullet \bar{B}}{|A||B|}$
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;***

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

6. ***Area of triangle ABC***

$$\frac{1}{2}\left|\overrightarrow{AB} \times \overrightarrow{BC}\right|$$