

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**

CLO 1
C3

- a) Solve the following to the simplest form.

Selesaikan yang berikut dalam bentuk termudah.

i.
$$\frac{(2ab)^2 - 4ab}{ab + 3ba - 4}$$

[3 marks]

[3 markah]

ii.
$$\frac{2p^2 + 12p}{p^2 - 36} \div \frac{4p^3}{p - 6}$$

[3 marks]

[3 markah]

CLO 1
C3

- b) Solve the following quadratic equations using the given method:

Selesaikan persamaan-persamaan kuadratik berikut dengan kaedah yang diberi:

i.
$$6(1 - x) = x^2 - 2x + 9$$
 (Factorization method)
(Kaedah Pemfaktoran)

[3 marks]

[3 markah]

ii.
$$2x^2 + 3x = 5$$
 (Quadratic formula)
(Formula kuadratik)

[4 marks]

[4 markah]

CLO 2
C3

c) Construct the partial fraction for the following equations:

Bentukkan pecahan separa bagi persamaan-persamaan berikut:

i.
$$\frac{5x+3}{(x^2-9)}$$

[5 marks]

[5 markah]

ii.
$$\frac{2x^2+7x+2}{x(x-1)^2}$$

[7 marks]

[7 markah]

QUESTION 2

SOALAN 2

CLO 1
C3

- a) Given that $w = 6 + 2i$, $x = -3 - 2i$ and $y = -2 - 3i$. Calculate each of the following in the form of $a + bi$.

Diberi persamaan $w = 6 + 2i$, $x = -3 - 2i$ dan $y = -2 - 3i$. Kirakan setiap yang berikut dalam bentuk $a + bi$.

i. $5w + 3x$

[3 marks]

[3 markah]

ii. $w - y^2$

[4 marks]

[4 markah]

CLO 1
C3

- b) Given that $m = 20 - 10i$ and $n = 2 + 4i$.

Diberi $m = 20 - 10i$ dan $n = 2 + 4i$.

- i. Sketch the Argand Diagram for $m - n$.

Lakarkan Gambarajah Argand bagi $m - n$.

[3 marks]

[3 markah]

- ii. Calculate the modulus and the argument for $m - n$.

Kirakan modulus dan hujah bagi $m - n$.

[5 marks]

[5 markah]

CLO 2
C3

- c) Given that $Z_1 = 5 + 3i$ and $Z_2 = 6(\cos 30^\circ + i \sin 30^\circ)$.
Diberi $Z_1 = 5 + 3i$ dan $Z_2 = 6(\cos 30^\circ + i \sin 30^\circ)$.

- i) Solve $Z_1 Z_2$ and $\frac{Z_1}{Z_2}$ in polar form.

Selesaikan $Z_1 Z_2$ dan $\frac{Z_1}{Z_2}$ dalam bentuk polar.

[6 marks]

[6 markah]

- ii) Express the answer (i) in exponential form.

Nyatakan jawapan (i) bentuk eksponen.

[4 marks]

[4 markah]

QUESTION 3

SOALAN 3

CLO 1
C2

a) Given matrices $A = \begin{bmatrix} 5 & -5 \\ a & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{bmatrix}$. Compute the following:

Diberi matriks $A = \begin{bmatrix} 5 & -5 \\ a & 1 \end{bmatrix}$ dan $B = \begin{bmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{bmatrix}$. Kirakan yang berikut:

- i. the value of a if $|A| = 40$
 nilai bagi a jika $|A| = 40$

[3 marks]

[3 markah]

- ii. $5AB^T$

[4 marks]

[4 markah]

CLO 1
C3

b) i. Given that $P = \begin{bmatrix} 1 & 2 \\ 3 & -4 \\ 4 & 3 \end{bmatrix}$ and $Q = \begin{bmatrix} 2 & -4 & 6 \\ 3 & 2 & 1 \end{bmatrix}$. Calculate $Q - P^T$.

Diberi $P = \begin{bmatrix} 1 & 2 \\ 3 & -4 \\ 4 & 3 \end{bmatrix}$ dan $Q = \begin{bmatrix} 2 & -4 & 6 \\ 3 & 2 & 1 \end{bmatrix}$. Kirakan $Q - P^T$.

[2 marks]

[2 markah]

ii. Calculate the inverse matrix of $M = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{bmatrix}$.

Kirakan matrik songsang bagi $M = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{bmatrix}$.

[6 marks]

[6 markah]

CLO 2
C3

c) Calculate the value of x, y and z using Cramer's rule.

Kirakan nilai bagi x, y dan z menggunakan Petua Cramer.

$$\begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & -3 \\ -3 & 4 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -5 \\ 4 \\ -7 \end{bmatrix}$$

[10 marks]

[10 markah]

QUESTION 4

SOALAN 4

CLO 1
C2

- a) Given that $\vec{a} = 2i + 2j + 2k$, $\vec{b} = 3i + 4j + 2k$ and $\vec{c} = 2i - j - k$. Express each of the following in term of i, j and k .

Diberi $\vec{a} = 2i + 2j + 2k$, $\vec{b} = 3i + 4j + 2k$ dan $\vec{c} = 2i - j - k$. Ungkapkan setiap yang berikut dalam i, j dan k .

i. $\vec{b} - \vec{a}$

[2 marks]

[2 markah]

ii. $2\vec{a} + 2\vec{c}$

[2 marks]

[2 markah]

iii. $4(\vec{b} - 2\vec{c})$

[3 marks]

[3 markah]

CLO 1
C3

- b) i. Given that $S(-4,3)$. Calculate the unit vector in the direction of \overrightarrow{OS} .

Diberi $S(-4,3)$. Kirakan vektor unit dalam arah \overrightarrow{OS} .

[4 marks]

[4 markah]

- ii. Given that vector $\overrightarrow{OP} = 2i + 5j + 2k$ and $\overrightarrow{OQ} = -4i - 2j + 3k$.

Express the vector of \overrightarrow{PQ}

Diberi vektor $\overrightarrow{OP} = 2i + 5j + 2k$ dan $\overrightarrow{OQ} = -4i - 2j + 3k$.

Tunjukkan vektor \overrightarrow{PQ}

[4 marks]

[4 markah]

CLO 2
C3

c) A, B and C is a triangle with $(1, 1, 2)$, $(2, 3, 3)$ and $(4, 2, -3)$. Calculate :
A, B dan C merupakan segitiga dengan bucu- bucu $(1, 1, 2)$, $(2, 3, 3)$ dan $(4, 2, -3)$. Kirakan :

i. \overrightarrow{AB} and \overrightarrow{BC}
 \overrightarrow{AB} dan \overrightarrow{BC}

[4 marks]

[4 markah]

ii. $\overrightarrow{AB} \times \overrightarrow{BC}$

[3 marks]

[3 markah]

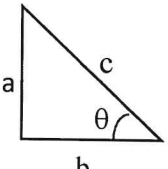
iii. Area of triangle ABC
Luas segitiga ABC

[3 marks]

[3 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM10013)

<p><u>QUADRATIC EQUATION</u></p> <ol style="list-style-type: none"> Quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Completing the square, $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$ 	<p><u>FORMULA OF TRIANGLE</u></p> <ol style="list-style-type: none"> Sine Rules; $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ Cosine Rules; $a^2 = b^2 + c^2 - 2bc \cos A$ Area of Triangle $= \frac{1}{2} ab \sin C$
<p><u>MATRIX</u></p> <ol style="list-style-type: none"> Cofactor; $C = (-1)^{i+j} M_{ij}$ Adjoin; $Adj(A) = C^T$ Inverse of Matrix; $A^{-1} = \frac{1}{ A } Adj(A)$ Cramer's Rule; $x = \frac{ A_1 }{ A }, \quad y = \frac{ A_2 }{ A }, \quad z = \frac{ A_3 }{ A }$ 	<p><u>COMPLEX NUMBER</u></p> <ol style="list-style-type: none"> Modulus of $z = \sqrt{a^2 + b^2}$ Argument of $z = \tan^{-1}\left(\frac{b}{a}\right)$ Cartesian Form; $z = a + bi$ Polar Form; $z = r \angle \theta$ Exponential Form; $z = re^{i\theta}$ Trigonometric Form; $z = r(\cos \theta + i \sin \theta)$
<p><u>TRIGONOMETRY</u></p> <p><u>Pythagoras' Theorem</u> <u>Trigonometric Identities</u></p> <div style="display: flex; align-items: center;"> <div style="flex: 1;">  <p style="text-align: center;">$c^2 = a^2 + b^2$</p> </div> <div style="flex: 2; padding-left: 20px;"> $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$ </div> </div>	<p><u>VECTOR & SCALAR</u></p> <ol style="list-style-type: none"> Unit Vector; $\hat{u} = \frac{\vec{u}}{ u }$ Cos $\theta = \frac{\vec{A} \cdot \vec{B}}{ A B }$ Scalar Product; $\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$ Vector Product; $\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$ Area of parallelogram ABC; $\vec{AB} \times \vec{BC}$
<p><u>COMPOUND-ANGLE</u></p> <ol style="list-style-type: none"> $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$ $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$ 	<p><u>DOUBLE-ANGLE</u></p> <ol style="list-style-type: none"> $\sin 2A = 2 \sin A \cos A$ $\cos 2A = \cos^2 A - \sin^2 A$ $= 1 - 2 \sin^2 A$ $= 2 \cos^2 A - 1$ $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$