

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2021 / 2022

DBM10013 : ENGINEERING MATHEMATICS 1

TARIKH : 27 JUN 2022

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

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

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

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
C3

- a) Solve the following algebraic expressions to the lowest form:

Selesaikan persamaan algebra berikut kepada bentuk termudah:

i. $\frac{3}{3y} + \frac{3}{2y}$

[3 marks]

[3 markah]

ii. $\frac{2}{y^2-1} + \frac{8}{y+1}$

[3 marks]

[3 markah]

CLO1
C3

- b) Find the values of the variable for the following quadratic equation by using completing the square:

Cari nilai pemboleh ubah bagi persamaan kuadratik berikut dengan kaedah penyempurnaan kuasa dua:

$$\frac{x+2}{x+2} = \frac{x+4}{2x+2}$$

[7 marks]

[7 markah]

CLO2
C3

c) Solve the following partial fraction decomposition:

Nyatakan ungkapan berikut dalam ungkapan pecahan separa:

$$\frac{12x^2+3x+18}{(x^2+3)(2x+1)}$$

[12 marks]

[12 markah]

QUESTION 2

SOALAN 2

CLO1
C3

- a) Solve the complex number equation below in the form
- $a + bi$
- :

Selesaikan persamaan nombor kompleks berikut dalam bentuk $a + bi$:

i. $(4-3i) + (i+10) - (2-3i)$

[2 marks]

[2 markah]

ii. $\left(\frac{1}{4(-5+6i)}\right)$

[5 marks]

[5 markah]

CLO1
C3

- b) Find the modulus and argument of
- z
- . Then, sketch the Argand's diagram for the each of the following:

Dapatkan modulus dan hujah bagi z . Kemudian, lakarkan gambarajah Argand bagi persamaan berikut:

i. $z = 5 - 6i$

[4 marks]

[4 markah]

ii. $z = -6 - \sqrt{27}i$

[4 marks]

[4 markah]

CLO2
C3

c) Change the complex number below in term as stated in the bracket:

Tukarkan persamaan nombor kompleks berikut dalam persamaan yang dinyatakan seperti dalam kurungan.

i. $Z = 5.34 - 8.1i$ (polar form)

[5 marks]

[5 markah]

ii. $Z = -27 + 3.5i$ (exponential form)

[5 marks]

[5 markah]

QUESTION 3

SOALAN 3

CLO1
C2

a) Given matrix:

Diberi matrik:

$$A = \begin{bmatrix} -1 & 8 & 12 \\ 3 & 0 & -6 \end{bmatrix}$$

$$B = \begin{bmatrix} 5 & 10 & -3 \\ 0 & 9 & 5 \end{bmatrix}$$

i. Express the order of matrix A

Nyatakan peringkat matrik A

[1 mark]

[1 markah]

ii. State the transposition of matrix, A^T *Nyatakan matriks tranposisi, A^T*

[2 marks]

[2 markah]

iii. Find matrix $A + B$ *Cari matrik $A + B$*

[4 marks]

[4 markah]

CLO1
C3

b) Given matrix:

Diberi matrik:

$$A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 0 & -2 \\ 5 & 3 \end{bmatrix}, C = \begin{bmatrix} 1 & 1 & 4 \\ 3 & 0 & 6 \end{bmatrix}, \text{ and } D = \begin{bmatrix} 2 & 4 & 1 \\ 4 & 3 & 7 \\ 2 & 1 & 3 \end{bmatrix}$$

Find:

Cari:

i. $A + B$

[2 marks]

[2 markah]

ii. $(B - A)^T$

[3 marks]

[3 markah]

iii. $3CD$

[3 marks]

[3 markah]

CLO2
C3

c) Solve the following equation by using the Cramer's rule.

Selesaikan persamaan berikut dengan kaedah hukum Cramer.

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

$$2x - 3y + 3z = 6$$

$$x + 4y - z = -5$$

[10 marks]

[10 markah]

QUESTION 4

SOALAN 4

CLO1
C2

- a) Given $\vec{A} = 3i + 10j$, $\vec{B} = 8i + 5j$, $\vec{C} = -4i + 2j - 9k$ and $\vec{D} = -i + 6j - 5k$.

Diberi $\vec{A} = 3i + 10j$, $\vec{B} = 8i + 5j$, $\vec{C} = -4i + 2j - 9k$ dan $\vec{D} = -i + 6j - 5k$.

- i. Represent the vector $\overrightarrow{AB}$ by using a triangle method.

Wakilkan vektor $\overrightarrow{AB}$ dengan menggunakan kaedah segitiga.

[3 marks]

[3 markah]

- ii. Express the negative vector of $\vec{A}$, $\vec{B}$, $\vec{C}$ and $\vec{D}$.

Nyatakan vektor negatif bagi $\vec{A}$, $\vec{B}$, $\vec{C}$ dan $\vec{D}$.

[4 marks]

[4 markah]

CLO1
C3

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

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

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

[2 marks]

[2 markah]

- ii. $5\vec{a} + 3\vec{c}$

[2 marks]

[2 markah]

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

[4 marks]

[4 markah]

CLO2
C3

- c) P, Q and R is a triangle with vertices (4,5,2), (3,1,1) and (1,3,1).
Calculate each of the following in terms of i, j and k:
*P, Q dan R merupakan segitiga dengan bucu-bucu (4,5,2), (3,1,1) dan (1,3,1).
Kirakan setiap yang berikut dalam sebutan i, j dan k:*

i. $\overrightarrow{PQ}$

[3 marks]

[3 markah]

ii. $\overrightarrow{PR}$

[3 marks]

[3 markah]

iii. $\overrightarrow{PQ} \times \overrightarrow{PR}$

[4 marks]

[4 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (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; $a^2 = b^2 + c^2 - 2bc \cos A$
3. Area of Triangle $= \frac{1}{2}ab \sin C$

MATRIX

1. Cofactor; $C = (-1)^{i+j} M_{ij}$
2. Adjoin; $\text{Adj}(A) = C^T$
3. Inverse of Matrix; $A^{-1} = \frac{1}{|A|} \text{Adj}(A)$
4. Cramer's Rule;

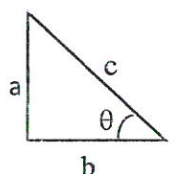
$$x = \frac{|A_1|}{|A|}, \quad y = \frac{|A_2|}{|A|}, \quad z = \frac{|A_3|}{|A|}$$

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; $z = r(\cos \theta + i \sin \theta)$

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

$$\begin{aligned} \tan \theta &= \frac{\sin \theta}{\cos \theta} \\ \cos^2 \theta + \sin^2 \theta &= 1 \\ 1 + \tan^2 \theta &= \sec^2 \theta \\ 1 + \cot^2 \theta &= \text{cosec}^2 \theta \end{aligned}$$

VECTOR & SCALAR

1. Unit Vector; $\hat{u} = \frac{\vec{u}}{|\vec{u}|}$
2. $\cos \theta = \frac{\vec{A} \cdot \vec{B}}{|\vec{A}| |\vec{B}|}$
3. Scalar Product;

$$\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$$
4. Vector Product;

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$
5. Area of parallelogram ABC;

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

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

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

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