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 II : 2024/2025

DBM10013 : ENGINEERING MATHEMATICS 1

TARIKH : 16 MEI 2025
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 a) Express each of the following expressions in the simplest form.

Ungkapkan setiap ungkapan berikut dalam bentuk termudah.

i. $x(y-2x)+x(y+3x)$

[3 marks]

[*3 markah*]

ii. $\frac{x-3}{y}\times\frac{y^2}{x^2-9}$

[4 marks]

[*4 markah*]

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

Selesaikan persamaan kuadratik berikut dengan menggunakan Formula Kuadratik.

$$2x^2+5x=3$$

[5 marks]

[*5 markah*]

CLO2

c) Solve the following partial fractions.

Selesaikan pecahan separa berikut.

i. $\dfrac{3x-4}{x(x+1)}$

[5 marks]

[*5 markah*]

ii. $\dfrac{2x-1}{(x-2)^2(x-5)}$

[8 marks]

[*8 markah*]

QUESTION 2

SOALAN 2

CLO1 a) Calculate the following complex number in form of $a + bi$.

Kira nombor kompleks berikut dalam bentuk $a + bi$.

i. $3(-3 - 2i) + 2(2 - i)$ [3 marks]

[*3 markah*]

ii. $\dfrac{4 - 2i}{1 - 3i}$

[5 marks]

[*5 markah*]

CLO1 b) Find modulus, argument and sketch Argand Diagram for $4 - 3i$.

Cari modulus, hujah dan lakarkan Rajah Argand bagi $4 - 3i$.

[7 marks]

[*7 markah*]

c) Given that $p = 4(\cos 20° + i \sin 20°)$ and $q = 8\angle 40°$.

Diberi $p = 4(\cos 20° + i \sin 20°)$ *dan* $q = 8\angle 40°$.

CLO2 i. Change p and q into exponential form.

Tukar p dan q dalam bentuk eksponen.

[4 marks]

[*4 markah*]

CLO2 ii. Calculate $p \times q$ and $\dfrac{q}{p}$ in trigonometric form.

Kira $p \times q$ *dan* $\dfrac{q}{p}$ *dalam bentuk trigonometri.*

[6 marks]

[*6 markah*]

QUESTION 3

SOALAN 3

CLO1 a) Given $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 9 & 10 \\ 3 & -1 & 5 \end{bmatrix}$, express:

Diberi $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \\ 3 & 4 \end{bmatrix}$ *dan* $B = \begin{bmatrix} 2 & 9 & 10 \\ 3 & -1 & 5 \end{bmatrix}$, *nyatakan:*

i. the order of matrix A and B

peringkat bagi matrik A dan B

[2 marks]

[*2 markah*]

ii. A^T and B^T

A^T *dan* B^T

[2 marks]

[*2 markah*]

CLO1 b) Calculate:

Kira:

i. $2\begin{pmatrix} 1 & 4 & 5 \\ 2 & 3 & 2 \end{pmatrix} + 3\begin{pmatrix} 1 & -1 & 4 \\ 3 & 5 & 2 \end{pmatrix}$

[4 marks]

[*4 markah*]

ii. values of p, q and r if given $\begin{pmatrix} 3 & p & 2 \\ 1 & -1 & 4 \end{pmatrix}\begin{pmatrix} 2 & q \\ 1 & 3 \\ 5 & 2 \end{pmatrix} = \begin{pmatrix} 16 & -2 \\ r & 3 \end{pmatrix}$

nilai p, q dan r jika diberi $\begin{pmatrix} 3 & p & 2 \\ 1 & -1 & 4 \end{pmatrix}\begin{pmatrix} 2 & q \\ 1 & 3 \\ 5 & 2 \end{pmatrix} = \begin{pmatrix} 16 & -2 \\ r & 3 \end{pmatrix}$

[6 marks]

[*6 markah*]

CLO2 c) Solve the following equation by using the Cramer's Rule.

Selesaikan persamaan berikut dengan menggunakan Petua Cramer.

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

[11 marks]

[*11 markah*]

QUESTION 4

SOALAN 4

CLO1 a) Given $A = 10i - 2j$ and $B = 4i + 6j$, find:

Diberi $A = 10i - 2j$ *dan* $B = 4i + 6j$, *cari*:

i. vector $\overrightarrow{AB}$

vektor $\overrightarrow{AB}$

[3 marks]

[*3 markah*]

ii. magnitude of vector $\overrightarrow{AB}$

magnitude bagi vektor $\overrightarrow{AB}$

[2 marks]

[*2 markah*]

iii. unit vector of vector $\overrightarrow{AB}$

vektor unit bagi vektor $\overrightarrow{AB}$

[2 marks]

[*2 markah*]

CLO1 b) Given $\vec{F} = 2i - 5j$ and $\vec{G} = 3i + j$, find:

Diberi $\vec{F} = 2i - 5j$ *dan* $\vec{G} = 3i + j$, *cari:*

i. $\vec{F} + \vec{G}$ by using Parallelogram method on graph paper.

$\vec{F} + \vec{G}$ *dengan menggunakan kaedah Segiempat Selari pada kertas graf.*

[4 marks]

[*4 markah*]

ii. $\vec{G} - \vec{F}$ by using Triangle Construction method on graph paper.
$\vec{G} - \vec{F}$ dengan menggunakan kaedah Pembinaan Segi Tiga pada kertas graf.

[4 marks]
[*4 markah*]

CLO2 c) JKL is a triangle with vertices $J\ (2,0,-2)$, $K\ (5,-2,3)$, and $L\ (0,5,4)$, calculate:
JKL adalah satu segi tiga dengan bucu $J\ (2,0,-2)$, $K\ (5,-2,3)$, *dan* $L\ (0,5,4)$, *kira:*

i. $JK \cdot KL$

[5 marks]
[*5 markah*]

ii. $JK \times KL$

[3 marks]
[*3 markah*]

iii. the area of parallelogram based on answer in c) ii
luas segiempat selari berdasarkan jawapan di c) ii

[2 marks]
[*2 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;***

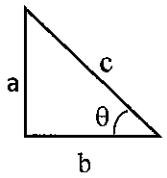
$$x = \frac{|A_1|}{|A|}, \quad y = \frac{|A_2|}{|A|}, \quad z = \frac{|A_3|}{|A|}$$

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;*** $\hat{u} = \frac{\vec{u}}{|u|}$
2. ***Cos θ*** $= \frac{\vec{A} \bullet \vec{B}}{|A||B|}$
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. $\tan 2A = \frac{2\tan A}{1 - tan^2A}$