

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2019

DBM10013: ENGINEERING MATHEMATICS 1



TARIKH : 21 OKTOBER 2019

MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

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

Subjektif (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)** subjective questions. Answer **ALL** questions.

ARAHAN :

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

QUESTION 1**SOALAN 1**

CLO1
C3

(a) Complete each of the following expressions:

Lengkapkan setiap ungkapan yang berikut:

i. $\frac{4a}{a-2} - 1$

[3 marks]

[3 markah]

ii. $\frac{2x}{x^2-4} \div \frac{2}{x-2}$



[3 marks]

[3 markah]

CLO1
C3

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

Selesaikan persamaan kuadratik di bawah dengan menggunakan kaedah yang diberi:

i. $x^2 - 6x + 2 = 0$ (Quadratic formula)
(Formula kuadratik)

[3 marks]

[3 markah]

ii. $3x^2 = 5 + 8x$ (Completing the square)
(Penyempurnaan kuasa dua)

[4 marks]

[4 markah]

CLO2
C3

(c) Construct the partial fraction for the following equations:

Bentukkan pecahan separa bagi persamaan berikut:

i.
$$\frac{2(1+x)}{x(x^2+4)}$$

[5 marks]

[5 markah]

ii.
$$\frac{x^3 - 2x^2 + 3}{x^2 + 5x + 4}$$

[7 marks]

[7 markah]



QUESTION 2**SOALAN 2**CLO1
C3

- (a) Given that $P = -4 + 6i$, $Q = 7 - 5i$ and $R = -6 - 2i$. Calculate each of the followings in the form of $a + bi$.

Diberi $P = -4 + 6i$, $Q = 7 - 5i$ dan $R = -6 - 2i$. Kirakan setiap yang berikut dalam bentuk $a + bi$.

i. $P - R$

[2 marks]

[2 markah]

ii. $2(R + P)$

[2 marks]

[2 markah]

iii. $\frac{Q}{P}$

[3 marks]

[3 markah]

CLO1
C3

- (b) Given that $R = 5 - 10i$ and $S = -8 + 2i$. Calculate the modulus and the argument: Then, sketch the Argand diagram for $R + S$.

Diberi $R = 5 - 10i$ dan $S = -8 + 2i$. Kirakan modulus dan hujah. Kemudian lakarkan dalam bentuk Gambarajah Argand bagi $R + S$.

[8 marks]

[8 markah]

CLO2
C3

(c)

- i. Solve the following expression in an exponential form.

Selesaikan ungkapan berikut dalam bentuk eksponen.

$$\frac{10(\cos 200^\circ + i \sin 200^\circ) \times 6(\cos 10^\circ + i \sin 10^\circ)}{20(\cos 70^\circ + i \sin 70^\circ)}$$

[6 marks]

[6 markah]

- ii. Given that $Z_1 = 10(\cos 12^\circ + i \sin 12^\circ)$ and $Z_2 = 20 \angle 125^\circ$. Solve $\frac{Z_2}{Z_1}$ in trigonometric form.

Diberi $Z_1 = 10(\cos 12^\circ + i \sin 12^\circ)$ dan $Z_2 = 20 \angle 125^\circ$. Selesaikan $\frac{Z_2}{Z_1}$

dalam bentuk trigonometrik.

[4 marks]

[4 markah]



QUESTION 3

SOALAN 3

CLO1
C2

(a) Referring to matrix $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & 4 \\ 2 & 7 & 6 \end{pmatrix}$, identify the element at:

Berdasarkan matriks $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & 4 \\ 2 & 7 & 6 \end{pmatrix}$, kenalpasti unsur pada:

i. A_{23}

[1 mark]

[1 markah]

ii. A_{21}

[1 mark]

[1 markah]

iii. A_{31}

[1 mark]

[1 markah]

iv. State the size of matrix A.
Nyatakan saiz matriks A.



[1 mark]

[1 markah]

v. Find $6A^T$.

Dapatkan $6A^T$.

[3 marks]

[3 markah]

CLO1
C3

(b) Given that $C = \begin{pmatrix} 2 & 3 & 5 \\ -3 & -1 & 4 \end{pmatrix}$ and $D = \begin{pmatrix} -1 & 3 \\ 5 & 7 \\ -3 & 2 \end{pmatrix}$.

Diberi $C = \begin{pmatrix} 2 & 3 & 5 \\ -3 & -1 & 4 \end{pmatrix}$ dan $D = \begin{pmatrix} -1 & 3 \\ 5 & 7 \\ -3 & 2 \end{pmatrix}$.

i. Calculate $C^T + D$.

Cari nilai $C^T + D$.

[4 marks]

[4 markah]

ii. Calculate $C \times D$

Cari nilai $C \times D$



[4 marks]

[4 markah]

CLO2
C3

(c) Solve the following equations using the Cramer's rule.

Selesaikan persamaan berikut dengan menggunakan Petua Cramer.

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

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

$$3x + y + 2z = 5$$

[10 marks]

[10 markah]

QUESTION 4

SOALAN 4

CLO1
C2

(a) Given that $\vec{m} = \begin{pmatrix} -3 \\ g \\ 4 \end{pmatrix}$, $\vec{n} = \begin{pmatrix} -1 \\ -1 \\ h \end{pmatrix}$ and $3\vec{n} - \vec{m} = \begin{pmatrix} 0 \\ -5 \\ 8 \end{pmatrix}$

Diberi $\vec{m} = \begin{pmatrix} -3 \\ g \\ 4 \end{pmatrix}$, $\vec{n} = \begin{pmatrix} -1 \\ -1 \\ h \end{pmatrix}$ dan $3\vec{n} - \vec{m} = \begin{pmatrix} 0 \\ -5 \\ 8 \end{pmatrix}$.

- i. Find the value of g and h.

Cari nilai g dan h.

[3 marks]

[3 markah]

- ii. Calculate $-\vec{n} + \vec{m}$

Cari nilai $-\vec{n} + \vec{m}$



[2 marks]

[2 markah]

- iii. Calculate $3\vec{m} - \vec{n}$

Cari nilai $3\vec{m} - \vec{n}$

[2 marks]

[2 markah]

CLO1
C3

(b)

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

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

[4 marks]

[4 markah]

- ii. Given that vectors $\overrightarrow{OP} = -i - 5j - 11k$ and $\overrightarrow{QR} = -4i - 2j + 3k$. Express the vectors of \overrightarrow{PR} and $\overrightarrow{QR} - \overrightarrow{PQ}$.

Diberi $\overrightarrow{OP} = -i - 5j - 11k$ dan $\overrightarrow{QR} = -4i - 2j + 3k$. Tunjukkan vektor \overrightarrow{PR} dan $\overrightarrow{QR} - \overrightarrow{PQ}$.

[4 marks]

[4 markah]

CLO2
C3

- (c) A triangle with vertices $P(2,0,-2)$, $Q(5,-2,3)$ and $R(0,5,4)$. Calculate:

Segitiga dengan sudut $P(2,0,-2)$, $Q(5,-2,3)$ dan $R(0,5,4)$. Kirakan

i. $\overrightarrow{PQ} \cdot \overrightarrow{QR}$

[5 marks]

[5 markah]

ii. $\overrightarrow{PQ} \times \overrightarrow{QR}$

[3 marks]

[3 markah]

- iii. Area of parallelogram based on the answer (c) ii.

Luas parallelogram berdasarkan jawapan (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*; $a^2 = b^2 + c^2 - 2bc \cos A$
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*;

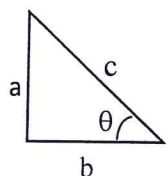
$$x = \frac{|A_1|}{|A|}, y = \frac{|A_2|}{|A|}, z = \frac{|A_3|}{|A|}$$

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

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

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

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

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

$$1 + \cot^2 \theta = \text{cosec}^2 \theta$$

VECTOR & SCALAR

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

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

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$
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. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$

