

SULIT



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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2018

DBM1013: ENGINEERING MATHEMATICS 1

TARIKH : 31 OKTOBER 2018

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Struktur (2 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A: 50 MARKS**BAHAGIAN A: 50 MARKAH****INSTRUCTION:**

This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

CLO1
C2

a) Express each of the following expressions in the simplest form:

Ungkapkan setiap yang berikut dalam bentuk termudah:

i. $\frac{1}{2}(4b + 3a) - 5(2b - a)$

[3 marks]

[3 markah]

ii. $\frac{2x+1}{4} - \frac{4x-1}{2x}$

[4 marks]

[4 markah]

iii. $\frac{12x - 4x^2}{6x^2 - 7x + 2} \div \frac{4x}{2x - 1}$

[3 marks]

[3 markah]

CLO1
C3

b) Calculate the roots for equations below by using the given method:

Kirakan punca-punca bagi persamaan di bawah dengan menggunakan kaedah yang diberi:

i. $2x^2 + 5x - 12 = 0$

(Using Factorization Method)

(Menggunakan Kaedah Pemfaktoran)

[3 marks]

[3 markah]

ii. $3x^2 = 4x + 9$

(Using Quadratic Formula)

(Menggunakan Formula Kuadratik)

[5 marks]

[5 markah]

iii. $4x^2 - 12x + 8 = 0$

(Using Completing the Square Method)

(Menggunakan Kaedah Penyempurnaan Kuasa Dua)

[7 marks]

[7 markah]

QUESTION 2

SOALAN 2

CLO1
C2

- a) Determine the value of A and B for partial fraction below:
Tentukan nilai A dan B bagi pecahan separa di bawah:

$$\frac{-x+10}{x^2+2x-15} = \frac{A}{x+5} + \frac{B}{x-3}$$

[4 marks]

[4 markah]

CLO1
C3

- b) Calculate the partial fraction for the following equations:
Kirakan pecahan separa bagi persamaan yang berikut:

i. $\frac{11-5x}{x^2-8x+16}$

[6 marks]

[6 markah]

ii. $\frac{10+5x-x^2}{(x+1)(x^2+2)}$

[7 marks]

[7 markah]

iii. $\frac{x^2}{x^2-5x+6}$

[8 marks]

[8 markah]

SECTION B: 50 MARKS**BAHAGIAN B: 50 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab DUA (2) soalan sahaja.

QUESTION 3**SOALAN 3**

CLO2
C2

- a) Given that $\tilde{a} = 5i + 4j + 2k$, $\tilde{b} = 2i + j - 2k$ and $\tilde{c} = -i - j + 4k$.

Express each of the following in the term of i , j and k .

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

[3 marks]

[3 markah]

ii. $5\tilde{a} + 3\tilde{c}$

[3 marks]

[3 markah]

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

[4 marks]

[4 markah]

CLO2
C3

- b) i. Given $R(-4,3)$ is a point in a Cartesian plane. Interpret the vector $\overrightarrow{OR}$ in terms of i and j . Calculate the unit vector in the direction of $\overrightarrow{OR}$.

Diberi $R(-4,3)$ ialah satu titik di dalam Rajah Cartesian. Tafsirkan vektor $\overrightarrow{OR}$ dalam sebutan i dan j . Kirakan vektor unit dalam arah $\overrightarrow{OR}$.

[4 marks]

[4 markah]

- ii. Calculate the area of parallelogram with vertices $A = (2, -4, 1)$, $B = (0, 5, 8)$ and $C = (4, 3, -6)$.

Kirakan luas parallelogram bagi sudut $A = (2, -4, 1)$, $B = (0, 5, 8)$ dan $C = (4, 3, -6)$.

[11 marks]

[11 markah]

QUESTION 4

SOALAN 4

CLO2
C2

- a) Given $\cos \theta = \frac{12}{13}$ where $0^\circ \leq \theta \leq 90^\circ$. Compute each following value without using calculator:

Diberi $\cos \theta = \frac{12}{13}$. Kira nilai tiap yang berikut tanpa menggunakan kalkulator:

i. $\tan \theta$ [3 marks]

[3 markah]

ii. $\operatorname{cosec} \theta$ [3 marks]

[3 markah]

iii. $\sec \theta$ [2 marks]

[2 markah]

iv. $\sin^2 \theta + \cos^2 \theta$ [2 marks]

[2 markah]

CLO2
C3

- b) Calculate the angles between $0^\circ \leq \theta \leq 360^\circ$ for the following equations:

Kira sudut-sudut antara $0^\circ \leq \theta \leq 360^\circ$ bagi persamaan-persamaan berikut:

i. $\cos \theta = 0.866$

[4 marks]

[4 markah]

ii. $\tan \theta = -1$

[3 marks]

[3 markah]

iii. $2 \cos^2 \theta + 3 \sin \theta - 3 = 0$

[8 marks]

[8 markah]

QUESTION 5

SOALAN 5

CLO2
C2

- a) Given $x = 4 + 8i$ and $y = -1 - 3i$, determine each of the following expression and write the answer in $a + bi$ form:

Diberi $x = 4 + 8i$ dan $y = -1 - 3i$, tentukan setiap ungkapan yang berikut dan beri jawapan dalam bentuk $a + bi$:

i. $x + y$

[2 marks]

[2 markah]

ii. xy

[4 marks]

[4 markah]

iii. $x - y^2$

[4 marks]

[4 markah]

CLO2
C3

- b) Given $Z_1 = 3 + 2i$ and $Z_2 = 3(\cos 30^\circ + i \sin 30^\circ)$:

Diberi $Z_1 = 3 + 2i$ dan $Z_2 = 3(\cos 30^\circ + i \sin 30^\circ)$:

- i. Calculate the modulus and the argument for Z_1 .

Kirakan modulus dan hujah bagi Z_1 .

[3 marks]

[3 markah]

- ii. Sketch the Argand's Diagram for Z_1 .

Lakarkan gambarajah Argand bagi Z_1

[2 marks]

[2 markah]

- iii. Calculate $Z_1 \times Z_2$ and $\frac{Z_1}{Z_2}$. Express the answer in polar form and exponential form.

Kirakan $Z_1 \times Z_2$ dan $\frac{Z_1}{Z_2}$. Ungkapkan jawapan dalam bentuk polar dan bentuk eksponen.

[10 marks]

[10 markah]

QUESTION 6

SOALAN 6

CLO2
C2

a) Given matrices $A = \begin{pmatrix} -1 & 0 \\ 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} -10 & 3 \\ 7 & 12 \\ 6 & -13 \end{pmatrix}$ and $C = \begin{pmatrix} 5 & -7 & 2 \\ 2 & 8 & -1 \\ 9 & -10 & 0 \end{pmatrix}$.

Calculate:

Diberi matriks $A = \begin{pmatrix} -1 & 0 \\ 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} -10 & 3 \\ 7 & 12 \\ 6 & -13 \end{pmatrix}$ dan $C = \begin{pmatrix} 5 & -7 & 2 \\ 2 & 8 & -1 \\ 9 & -10 & 0 \end{pmatrix}$. Kira:

i. B^T

[1 mark]

[1 markah]

ii. C^T

[1 mark]

[1 markah]

iii. $|A|$

[2 marks]

[2 markah]

iv. $|A|B^T$

[2 marks]

[2 markah]

v. B^TC

[4 marks]

[4 markah]

CLO2
C3

- b) i. Calculate the minor, cofactor and adjoint of matrix $M = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{pmatrix}$.

Kira minor, ko-faktor dan adjoin bagi matriks $M = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{pmatrix}$.

[4 marks]

[4 markah]

- ii. Calculate the value of x, y and z for the following equation by using Cramer's Rule:

Kirakan nilai x, y dan z bagi persamaan berikut dengan menggunakan Petua Cramer:

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

$$x - y - z = 4$$

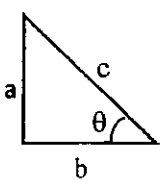
$$x + 2y + 3z = 6$$

[11 marks]

[11 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

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 <u>Pythagoras' Theorem</u>  $c^2 = a^2 + b^2$ <u>Trigonometric Identities</u> $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \text{cosec}^2 \theta$	VECTOR & SCALAR 1. Unit Vector; $\hat{u} = \frac{\vec{u}}{ \vec{u} }$ 2. $\cos \theta = \frac{\vec{A} \cdot \vec{B}}{ \vec{A} \vec{B} }$ 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. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$