SULIT

POLITEKNIK MALAYSIA

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)

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

[6 marks]

[*6 markah*]

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

[7 marks]

[*7 markah*]

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

[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 $0° \leq \theta \leq 90°$. 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. $cosec\,\theta$

[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 $0° \leq \theta \leq 360°$ for the following equations:

Kira sudut-sudut antara $0° \leq \theta \leq 360°$ *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 $Z_2 = 3(\cos 30° + i \sin 30°)$:
Diberi $Z_1 = 3 + 2i$ *dan* $Z_2 = 3(\cos 30° + i \sin 30°)$*:*

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;*** $\mathbf{a^2 = b^2 + c^2 - 2bc \cos A}$
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;***

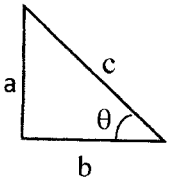
$$x = \frac{|A_1|}{|A|}, y = \frac{|A_2|}{|A|}, z = \frac{|A_3|}{|A|}$$

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;*** $z = r\,(\cos\theta + \mathrm{i}\sin\theta)$

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identitie

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

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

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

$$1 + cot^2\theta = cosec^2\theta$$

VECTOR & SCALAR

1. ***Unit Vector;*** $\hat{u} = \frac{\bar{u}}{|u|}$
2. ***Cos θ*** $= \frac{\bar{A} \bullet \bar{B}}{|A||B|}$
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;***

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

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

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

$$= 2cos^2A - 1$$

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