

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

**PEPERIKSAAN AKHIR
SESI DISEMBER 2017**

DBM1013 : ENGINEERING MATHEMATICS 1

**TARIKH : 09 APRIL 2018
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)**

Kertas ini mengandungi **DUA BELAS (12)** 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 question. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **DUA (2)** soalan struktur. Jawab **SEMUA** soalan.

QUESTION 1

SOALAN 1

CLO1
C2

- a) Simplify each of the following as a single fraction in the lowest terms.

Permudahkan setiap sebutan berikut sebagai pecahan tunggal dalam sebutan terendah.

i. $\frac{7p^4q^3z}{28p^2q^5}$

[2 marks]

[2 markah]

ii. $\frac{2}{m-3} + \frac{1}{3-m}$

[3 marks]

[3 markah]

iii. $\frac{3x+3}{x^2+3x+2} - \frac{2}{x+1}$

[5 marks]

[5 markah]

CLO1
C3

b) Solve the quadratic equations.

Selesaikan persamaan-persamaan kuadratik berikut.

i. $5x^2 - 7x - 6 = 0$ (By using factorization method)

[3 marks]

[3 markah]

ii. $2x^2 + 3x = 5$ (By using quadratic formula)

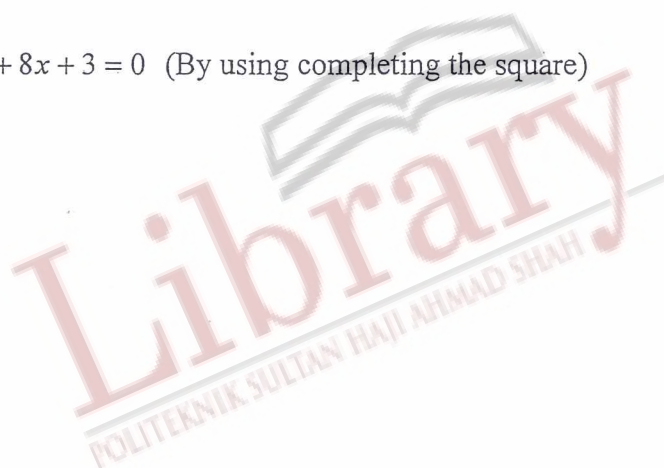
[5 marks]

[5 markah]

iii. $4x^2 + 8x + 3 = 0$ (By using completing the square)

[7 marks]

[7 markah]



Library
POLITEKNIK SULTAN HAJI AHMAD SHAH

QUESTION 2

SOALAN 2

CLO1
C2

a) Express the fraction in partial fractions.

Nyatakan pecahan yang berikut kepada pecahan separa.

$$\frac{x^2 - 1}{x - 2}$$

[4 marks]

[4 markah]

CLO1
C3

b) Solve the following partial fractions.

Selesaikan pecahan separa berikut.

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

[5 marks]

[5 markah]

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

[5 marks]

[5 markah]

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

[5 marks]

[5 markah]

iv. $\frac{x^2+2x+1}{(2x^2-5x+7)(x+1)}$

[6 marks]

[6 markah]

SECTION B: 50 MARKS

BAHAGIAN B: 50 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 3

SOALAN 3

CLO2
C2

- a) A triangle has vertices $P = (2, -1, 0)$, $Q = (3, 4, 1)$ and $R = (0, 3, -2)$. Determine the area for a triangle of PQR .

*Sebuah segitiga mempunyai sudut $P = (2, -1, 0)$, $Q = (3, 4, 1)$ dan $R = (0, 3, -2)$.
Tentukan luas bagi segitiga PQR .*

[10 marks]

[10 markah]

CLO2
C3

- b) If position vectors \vec{OA} , \vec{OB} and \vec{OC} are defined by $\vec{OA} = 4\mathbf{i} - \mathbf{j} + 2\mathbf{k}$, $\vec{OB} = 3\mathbf{i} + \mathbf{j} + 3\mathbf{k}$, and $\vec{OC} = \mathbf{i} - \mathbf{k}$. Calculate:

Sekiranya kedudukan vektor-vektor \vec{OA} , \vec{OB} dan \vec{OC} ditakrifkan sebagai

$\vec{OA} = 4\mathbf{i} - \mathbf{j} + 2\mathbf{k}$, $\vec{OB} = 3\mathbf{i} + \mathbf{j} + 3\mathbf{k}$, and $\vec{OC} = \mathbf{i} - \mathbf{k}$. Kirakan:

- i. Vector \vec{AB}

Vektor \vec{AB}

[3 marks]

[3 markah]

- ii. Vector \vec{BC}

Vektor \vec{BC}

[3 marks]

[3 markah]

- iii. Vector \vec{AC}

Vektor \vec{AC}

[3 marks]

[3 markah]

- iv. $\vec{OA} \times (\vec{OB} \times \vec{OC})$

[6 marks]

[6 markah]

QUESTION 4

SOALAN 4.

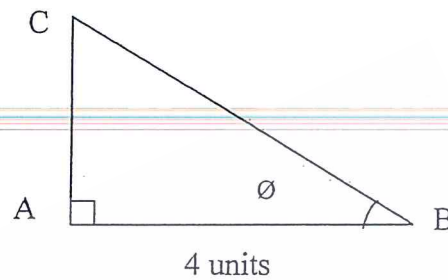


Diagram 5(a)

Rajah 5 (a)

CLO2
C2a) Referring to Diagram 5(a), given that $\cot \phi = 0.577$ and $AB = 4$ units. Determine:*Merujuk kepada rajah 5(a), diberi $\cot \phi = 0.577$ dan $AB = 4$ units. Tentukan:*

- i. The value of the angle,
- ϕ

[3 marks]

[3 markah]

- ii. The perimeter of the triangle.

[7 marks]

[7 markah]

CLO2
C3b) Solve the following equations for $0^\circ \leq \theta \leq 360^\circ$:*Selesaikan persamaan trigonometri berikut untuk $0^\circ \leq \theta \leq 360^\circ$:*

i. $2 \cos^2 \theta - \sin^2 \theta = 4 \sin \theta - 2$

[7 marks]

[7 markah]

ii. $9 \tan \theta + \tan^2 \theta = 5 \sec^2 \theta - 3$

[8 marks]

[8 markah]

QUESTION 5

SOALAN 5

CLO2
C2

- a) Given $P = 12\angle 125^\circ$, $Q = -5 - 3i$ and $R = -2 + i$. Compute the following in Cartesian form.

Diberi $P = 12\angle 125^\circ$, $Q = -5 - 3i$ dan $R = -2 + i$. Kira nombor kompleks berikut dalam bentuk cartesian :

i. $Q - R$

[2 marks]

[2 markah]

ii. $2PQ$

[4 marks]

[4 markah]

iii. $\frac{1}{3Q} + R$

[4 marks]

[4 markah]

CLO2
C3b) If $Z_1=1+i$, $Z_2=2-i$ and $Z_3=3+2i$, express the following in the form of $a + bi$.

Jika $Z_1=1+i$; $Z_2=2-i$ dan $Z_3=3+2i$; ungkapkan yang berikut dalam sebutan $a + bi$.

i. $4Z_1 + Z_2$

[2 marks]

[2 markah]

ii. $\frac{1}{Z_1} + \frac{1}{Z_3}$

[4 marks]

[4 markah]

iii. $\frac{Z_1 + 2i}{1 + Z_2 i}$

[4 marks]

[4 markah]

iv. $\frac{Z_3 - Z_2}{2 - Z_1 i}$

[5 marks]

[5 markah]

QUESTION 6

SOALAN 6

CLO2
C2

a) Given matrices, $A = \begin{bmatrix} 2 & 5 \\ 0 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 5 \\ 3 \\ 9 \end{bmatrix}$, $C = \begin{bmatrix} -7 & 1 & 5 \end{bmatrix}$, $D = \begin{bmatrix} 3 \\ 8 \end{bmatrix}$ and

$$E = \begin{bmatrix} 1 & 9 \end{bmatrix}.$$

Diberi matrik, $A = \begin{bmatrix} 2 & 5 \\ 0 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 5 \\ 3 \\ 9 \end{bmatrix}$, $C = \begin{bmatrix} -7 & 1 & 5 \end{bmatrix}$, $D = \begin{bmatrix} 3 \\ 8 \end{bmatrix}$ dan

$$E = \begin{bmatrix} 1 & 9 \end{bmatrix}.$$

Determine:

Tentukan:

i. EA

[2 marks]

[2 markah]

ii. ED

[2 marks]

[2 markah]

iii. BC

[3 marks]

[3 markah]

iv. AD

[3 marks]

[3 markah]

CLO2
C3

b) Solve the following equations by using the inverse matrix method:

Selesaikan persamaan matriks berikut dengan menggunakan kaedah matriks songsangan:

$$4x + 3y - 2z = 7$$

$$x + y = 5$$

$$3x + z = 4$$

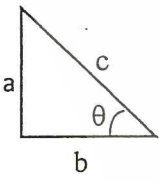
[15 marks]

[15 markah]

SOALAN TAMAT

Library
POLITEKNIK SULTAN HAJI AHMAD SHAH

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

<p><u>QUADRATIC EQUATION</u></p> <ol style="list-style-type: none"> 1. Quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ 2. Completing the square, $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$ 	<p><u>FORMULA OF TRIANGLE</u></p> <ol style="list-style-type: none"> 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 $= \frac{1}{2}ab \sin C$
<p><u>MATRIX</u></p> <ol style="list-style-type: none"> 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; $x = \frac{ A_1 }{ A }, y = \frac{ A_2 }{ A }, z = \frac{ A_3 }{ A }$ 	<p><u>COMPLEX NUMBER</u></p> <ol style="list-style-type: none"> 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; $z = r (\cos \theta + i \sin \theta)$
<p><u>TRIGONOMETRY</u></p> <p><u>Pythagoras' Theorem</u></p>  $c^2 = a^2 + b^2$ <p><u>Trigonometric Identities</u></p> $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \text{cosec}^2 \theta$	<p><u>VECTOR & SCALAR</u></p> <ol style="list-style-type: none"> 1. Unit Vector; $\hat{u} = \frac{\vec{u}}{ u }$ 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; $\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$ 5. Area of parallelogram ABC; $\vec{AB} \times \vec{BC}$
<p><u>COMPOUND-ANGLE</u></p> <ol style="list-style-type: none"> 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. $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$ 	<p><u>DOUBLE-ANGLE</u></p> <ol style="list-style-type: none"> 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. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$