

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

$$\frac{2(m-3) + 1(3-m)}{(m-3)(3-m)}$$

[3 marks]

[3 markah]

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

[5 marks]

[5 markah]

CLO1

b) Solve the quadratic equations.

C3

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]

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 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 keduakuan 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}

$$\text{Vektor } \vec{AB}$$

[3 marks]

[3 markah]

- ii. Vector \vec{BC}

$$\text{Vektor } \vec{BC}$$

[3 marks]

[3 markah]

- iii. Vector \vec{AC}

$$\text{Vektor } \vec{AC}$$

[3 marks]

[3 markah]

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

[6 marks]

[6 markah]

QUESTION 4

SOALAN 4

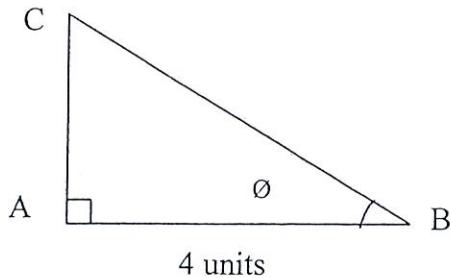


Diagram 5(a)

Rajah 5 (a)

CLO2 a) Referring to Diagram 5(a), given that $\cot \phi = 0.577$ and $AB = 4$ units. Determine:

C2

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 b) Solve the following equations for $0^\circ \leq \theta \leq 360^\circ$:

C3

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 cartesan :

i. $Q - R$

[2 marks]

[2 markah]

ii. $2PQ$

[4 marks]

[4 markah]

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

[4 marks]

[4 markah]

CLO2
C3

- b) 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
langsung:*

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

$$x + y = 5$$

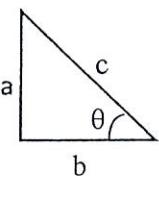
$$3x + z = 4$$

[15 marks]

[15 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

<p><u>QUADRATIC EQUATION</u></p> <ol style="list-style-type: none"> 1. <i>Quadratic formula</i>, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ 2. <i>Completing the square</i>, $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$	<p><u>FORMULA OF TRIANGLE</u></p> <ol style="list-style-type: none"> 1. <i>Sine Rules</i>; $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ 2. <i>Cosine Rules</i>; $a^2 = b^2 + c^2 - 2bc \cos A$ 3. <i>Area of Triangle</i> $= \frac{1}{2} ab \sin C$
<p><u>MATRIX</u></p> <ol style="list-style-type: none"> 1. <i>Cofactor</i>; $C = (-1)^{i+j} M_{ij}$ 2. <i>Adjoin</i>; $\text{Adj}(A) = C^T$ 3. <i>Inverse of Matrix</i>; $A^{-1} = \frac{1}{ A } \text{Adj}(A)$ 4. <i>Cramer's Rule</i>; $x = \frac{ A_1 }{ A }, y = \frac{ A_2 }{ A }, z = \frac{ A_3 }{ A }$	<p><u>COMPLEX NUMBER</u></p> <ol style="list-style-type: none"> 1. <i>Modulus of z</i> $= \sqrt{a^2 + b^2}$ 2. <i>Argument of z</i> $= \tan^{-1} \left(\frac{b}{a} \right)$ 3. <i>Cartesian Form</i>; $z = a + bi$ 4. <i>Polar Form</i>; $z = r \angle \theta$ 5. <i>Exponential Form</i>; $z = re^{i\theta}$ 6. <i>Trigonometric Form</i>; $z = r (\cos \theta + i \sin \theta)$
<p><u>TRIGONOMETRY</u></p> <p><u>Pythagoras' Theorem</u></p>  $c^2 = a^2 + b^2$	<p><u>Trigonometric Identities</u></p> $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$
<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. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$

