

SULIT



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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2017

DBM1013 : ENGINEERING MATHEMATICS 1

TARIKH : 25 OKTOBER 2017

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 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 ungkapan berikut dalam bentuk termudah :

i. $4x^2 + 3x(-9x + 6)$

[2 marks]

[2 markah]

ii. $5m^2n^3 - (6mn - 4m^2n^3 + 3) + 6$

[3 marks]

[3 markah]

iii. $\frac{x^2 - x - 6}{x - 3} \times \frac{5}{3x + 6}$

[3 marks]

[3 markah]

iv. $6(n - 2a) - 5(n + 3a)$

[2 marks]

[2 markah]

CLO1
C3

- b) Evaluate the roots for the equations below by using the given method :
Nilaiikan punca-punca bagi persamaan di bawah dengan menggunakan kaedah yang diberikan:

i. $n^2 - 8n + 12 = 0$
 (Using Factorization Method)
 (Menggunakan Kaedah Pemfaktoran)

[3 marks]
 [3 markah]

ii. $2m(m - 2) = m - 2$
 (Using Quadratic Formula)
 (Menggunakan Formula Kuadratik)

[5 marks]
 [5 markah]

iii. $f(f - 1) = 18$
 (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 untuk pecahan separa di bawah :

$$\frac{x+7}{(x-3)(x+2)} = \frac{A}{x-3} + \frac{B}{x+2}$$

[4 marks]
 [4 markah]

CLO1
C3

- b) Solve the partial fraction decomposition for the following equation :
Selesaikan penguraian pecahan separa untuk persamaan berikut :

i. $\frac{-x+3}{x^2-9x+20}$

[6 marks]
 [6 markah]

ii. $\frac{8x^2-12}{x(x^2+2x-6)}$

[7 marks]
 [7 markah]

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

[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

- a) The diagram 3 below shows the position of vectors \vec{JK} and \vec{LM} in a Cartesian Plane.
Rajah 3 di bawah menunjukkan posisi bagi vektor \vec{JK} dan \vec{LM} di dalam Rajah Cartesian.

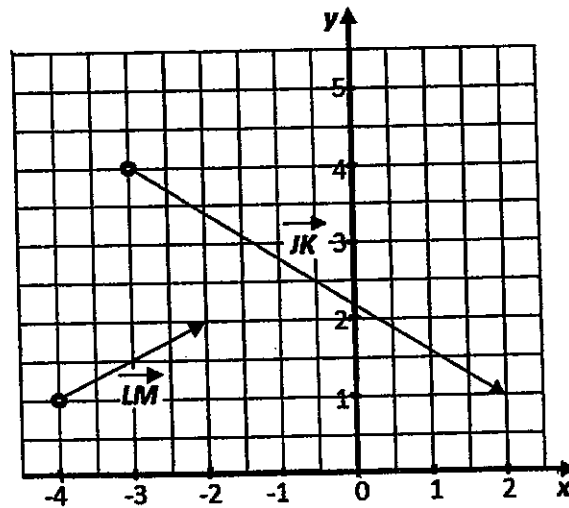


Diagram 3
Rajah 3

- i. Express both vectors in matrix notation.
Ungkapkan kedua-dua vektor tersebut dalam bentuk matrix.

[2 marks]

[2 markah]

CLO2
C2

- ii. Calculate the value of $\vec{LM} - \vec{JK}$.
Kirakan nilai bagi $\vec{LM} - \vec{JK}$

[3 marks]

[3 markah]

- iii. Determine the unit vector of \vec{JK} .
Tentukan vektor unit bagi \vec{JK}

[5 marks]

[5 markah]

CLO2
C3

- b) Given the position vectors $\vec{OP} = 2i + j + 4k$, $\vec{OQ} = -i + 2j + 2k$ and $\vec{OR} = 3i - 3j + k$. Solve:

Diberi posisi bagi vektor $\vec{OP} = 2i + j + 4k$, $\vec{OQ} = -i + 2j + 2k$ dan $\vec{OR} = 3i - 3j + k$. Selesaikan:

i. \vec{PQ}

[2 marks]

[2 markah]

ii. $|\vec{QR}|$

[4 marks]

[4 markah]

iii. $\vec{PQ} \times \vec{QR}$

[4 marks]

[4 markah]

iv. $\vec{PQ} \cdot (\vec{PQ} + \vec{QR})$

[5 marks]

[5 markah]

QUESTION 4

SOALAN 4

CLO2
C2

- a) Refer to Diagram 4, given $xy = 20$ and $xz = 12$. Determine :
Merujuk kepada Rajah 4, diberi $xy = 20$ dan $xz = 12$. Tentukan :

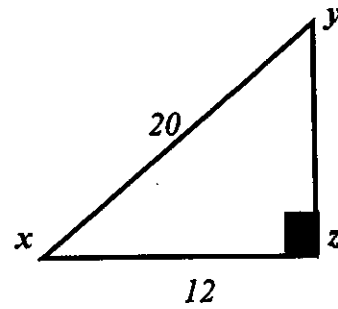


Diagram 4
Rajah 4

- i. Length of yz [2 marks]
[2 markah]
- ii. $\sin x$ [2 marks]
[2 markah]
- iii. $\cot y$ [3 marks]
[3 markah]
- iv. $\sec x + \operatorname{cosec} x$ [3 marks]
[3 markah]

CLO2
C3

- b) Calculate all the nearest degree in the interval $0^\circ \leq \theta \leq 360^\circ$ that satisfy the equation below :

Kirakan semua sudut terdekat yang terdapat di dalam sela $0^\circ \leq \theta \leq 360^\circ$ yang memenuhi persamaan di bawah :

- i. $\sec \theta = 6.96$ [4 marks]
[4 markah]
- ii. $3 \cos 2\theta + \sin \theta - 1 = 0$ [11 marks]
[11 markah]

QUESTION 5

SOALAN 5

- a) Given equation $= 6 + i$, $w = -1 + 5i$ and $z = 4 - 8i$. Determine each of the following in the form of $a + bi$.

Diberi persamaan $= 6 + i$, $w = -1 + 5i$ and $z = 4 - 8i$. tentukan setiap yang berikut dalam bentuk $a + bi$.

i. $2x + 4z$

[3 marks]

[3 markah]

ii. $w \times z$

[3 marks]

[3 markah]

iii. $\frac{x}{w}$

[4 marks]

[4 markah]

CLO2
C2

CLO2
C3

- b) Given $P = 6 - 8i$ and $Q = -4 + i$. Sketch the Argand's Diagram. Then, determine the modulus and the argument for the complex number below :

Diberi $P = 6 - 8i$ dan $Q = -4 + i$. Lakarkan Gambarajah Argand. Seterusnya, tentukan modulus dan hujah bagi nombor kompleks di bawah :

i. P

[6 marks]

[6 markah]

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

[9 marks]

[9 markah]

QUESTION 6

SOALAN 6

CLO2
C2

a) Referring to matrix $B = \begin{pmatrix} 3 & 5 & -3 \\ 0 & 8 & 4 \\ -1 & 7 & 2 \end{pmatrix}$, identify the element at:

Berdasarkan matriks $B = \begin{pmatrix} 3 & 5 & -3 \\ 0 & 8 & 4 \\ -1 & 7 & 2 \end{pmatrix}$, kenalpasti unsur pada:

i. B_{23}

[1 mark]

[1 markah]

ii. B_{21}

[1 mark]

[1 markah]

iii. B_{31}

[1 mark]

[1 markah]

iv. Calculate BI , where I is Identity Matrix
Kirakan BI , di mana I adalah matrix Identiti

[2 marks]

[2 markah]

v. Calculate B^T
Kirakan B^T

[2 marks]

[2 markah]

vi. Calculate $B^T + B$
Kirakan $B^T + B$

[3 marks]

[3 markah]

CLO2
C3

b) i. Solve the following equations by using Inverse Method.

Selesaikan persamaan berikut dengan menggunakan Kaedah Songsangan.

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

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

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

[10 marks]

[10 markah]

ii. If $|A| = 2$, calculate the value of x , y and z in the following equations by using Cramer's Rule:

Jika $|A| = 2$, kirakan nilai x , y dan z dalam persamaan berikut dengan menggunakan Petua Cramer.

$$5x - y + 7z = 4$$

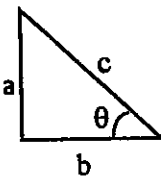
$$6x - 2y + 9z = 5$$

$$2x + 8y - 4z = 8$$

[5 marks]

[5 markah]

SOALAN TAMAT

<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. $\cos \theta = \frac{\vec{A} \cdot \vec{B}}{ A B }$ 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. $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$