

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR  
SESI JUN 2017

**DBM1013 : ENGINEERING MATHEMATICS 1**

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**TARIKH : 25 OKTOBER 2017**  
**MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)**

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Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.

Bahagian A: Struktur (2 soalan)

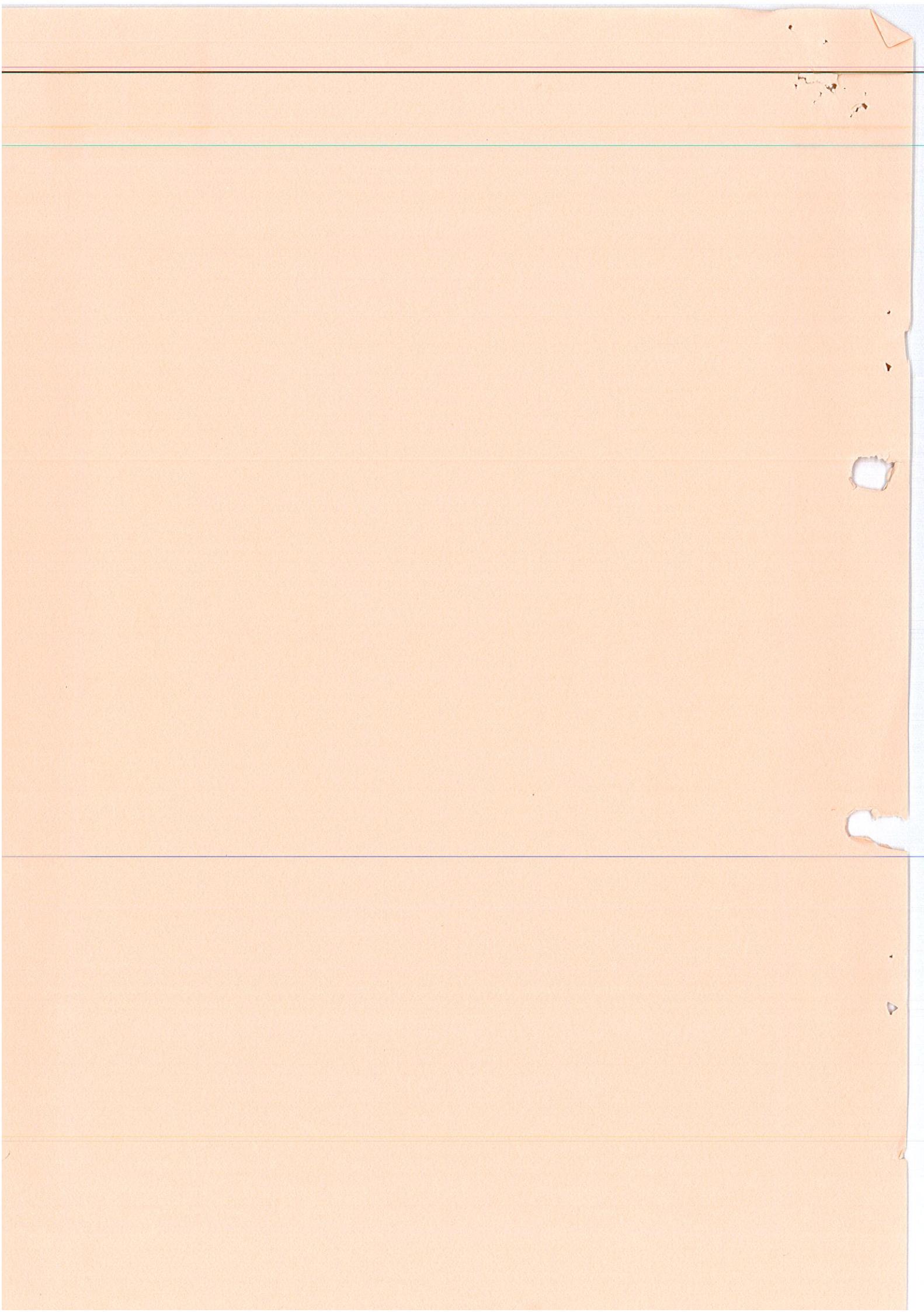
Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

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**JANGAN BUKA KERTAS SOALANINI 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 :

*Nilaikan 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**

CLO2  
C2

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

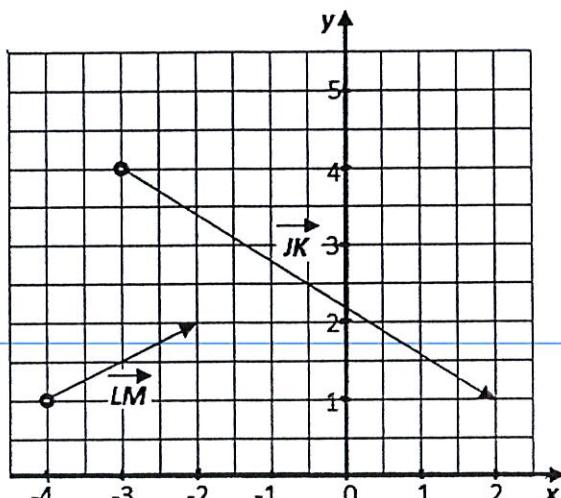


Diagram 3  
*Rajah 3*

- i. Express both vectors in matrix notation.

*Ungkapkan kedua-dua vektor tersebut dalam bentuk matrix.*

[2 marks]

[2 markah]

- ii. Calculate the value of  $\overrightarrow{LM} - \overrightarrow{JK}$ .

*Kirakan nilai bagi  $\overrightarrow{LM} - \overrightarrow{JK}$*

[3 marks]

[3 markah]

- iii. Determine the unit vector of  $\overrightarrow{JK}$

*Tentukan vektor unit bagi  $\overrightarrow{JK}$*

[5 marks]

[5 markah]

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

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

i.  $\overrightarrow{PQ}$

[2 marks]

[2 markah]

ii.  $|\overrightarrow{QR}|$

[4 marks]

[4 markah]

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

[4 marks]

[4 markah]

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

[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 :*

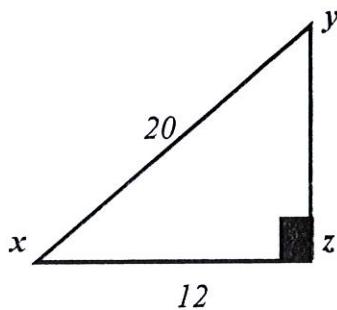


Diagram 4  
*Rajah 4*

i. Length of  $yz$

[2 marks]

[2 markah]

ii.  $\sin x$

[2 marks]

[2 markah]

iii.  $\cot y$

[3 marks]

[3 markah]

iv.  $\sec x + \cosec x$

[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**CLO2  
C2

- 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  
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 matriks 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.*

$$\begin{aligned}x + 3y + 3z &= 4 \\2x - 3y - 2z &= 2 \\3x + y + 2z &= 5\end{aligned}$$

[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.*

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

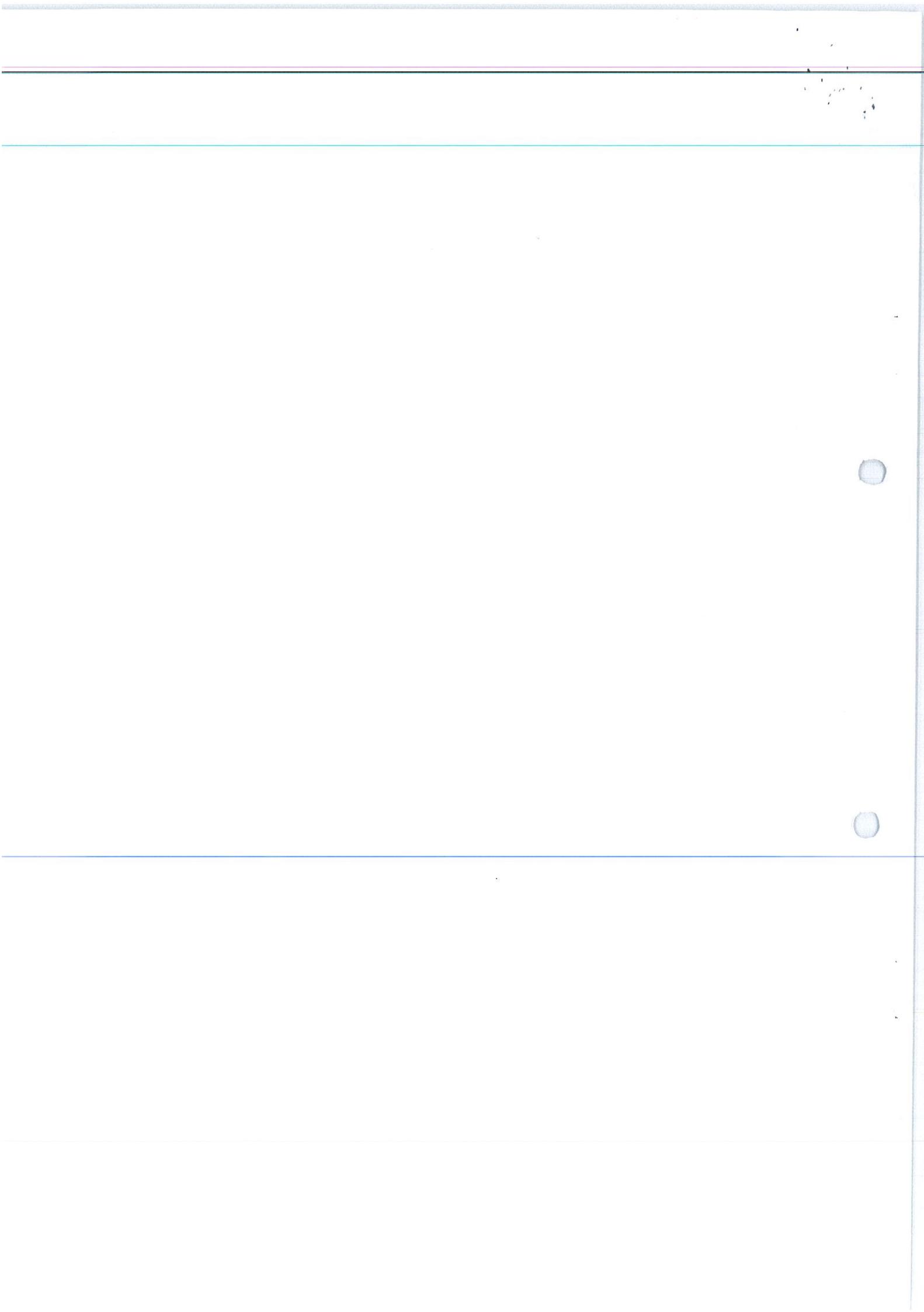
$$6x - 2y + 9z = 5$$

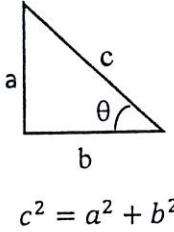
$$2x + 8y - 4z = 8$$

[5 marks]

[5 markah]

SOALAN TAMAT



<p><u>QUADRATIC EQUATION</u></p> <ol style="list-style-type: none"> <li>1. <i>Quadratic formula</i>, <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math></li> <li>2. <i>Completing the square</i>,</li> </ol> $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$	<p><u>FORMULA OF TRIANGLE</u></p> <ol style="list-style-type: none"> <li>1. <i>Sine Rules</i>; <math>\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}</math></li> <li>2. <i>Cosine Rules</i>; <math>a^2 = b^2 + c^2 - 2bc \cos A</math></li> <li>3. <i>Area of Triangle</i> <math>= \frac{1}{2}ab \sin C</math></li> </ol>
<p><u>MATRIX</u></p> <ol style="list-style-type: none"> <li>1. <i>Cofactor</i>; <math>C = (-1)^{i+j} M_{ij}</math></li> <li>2. <i>Adjoin</i>; <math>\text{Adj}(A) = C^T</math></li> <li>3. <i>Inverse of Matrix</i>; <math>A^{-1} = \frac{1}{ A } \text{Adj}(A)</math></li> <li>4. <i>Cramer's Rule</i>;</li> </ol> $x = \frac{ A_1 }{ A }, y = \frac{ A_2 }{ A }, z = \frac{ A_3 }{ A }$	<p><u>COMPLEX NUMBER</u></p> <ol style="list-style-type: none"> <li>1. <i>Modulus of z</i> <math>= \sqrt{a^2 + b^2}</math></li> <li>2. <i>Argument of z</i> <math>= \tan^{-1} \left( \frac{b}{a} \right)</math></li> <li>3. <i>Cartesian Form</i>; <math>z = a + bi</math></li> <li>4. <i>Polar Form</i>; <math>z = r \angle \theta</math></li> <li>5. <i>Exponential Form</i>; <math>z = re^{i\theta}</math></li> <li>6. <i>Trigonometric Form</i>; <math>z = r (\cos \theta + i \sin \theta)</math></li> </ol>
<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>VECTOR &amp; SCALAR</u></p> <ol style="list-style-type: none"> <li>1. <i>Unit Vector</i>; <math>\hat{u} = \frac{\vec{u}}{ \vec{u} }</math></li> <li>2. <i>Cos Θ</i> <math>= \frac{\vec{A} \bullet \vec{B}}{ \vec{A}   \vec{B} }</math></li> <li>3. <i>Scalar Product</i>;  <math display="block">\vec{A} \bullet \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2</math></li> <li>4. <i>Vector Product</i>;  <math display="block">\vec{A} \times \vec{B} = \begin{vmatrix} i &amp; j &amp; k \\ a_1 &amp; b_1 &amp; c_1 \\ a_2 &amp; b_2 &amp; c_2 \end{vmatrix}</math></li> <li>5. <i>Area of parallelogram ABC</i>;  <math display="block"> \vec{AB} \times \vec{BC} </math></li> </ol>
<p><u>COMPOUND-ANGLE</u></p> <ol style="list-style-type: none"> <li>1. <math>\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B</math></li> <li>2. <math>\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B</math></li> <li>3. <math>\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}</math></li> </ol>	<p><u>DOUBLE-ANGLE</u></p> <ol style="list-style-type: none"> <li>1. <math>\sin 2A = 2 \sin A \cos A</math></li> <li>2. <math>\cos 2A = \cos^2 A - \sin^2 A</math>  <math display="block">= 1 - 2 \sin^2 A</math>  <math display="block">= 2 \cos^2 A - 1</math></li> <li>3. <math>\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}</math></li> </ol>

