

**SULIT**



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI  
KEMENTERIAN PENGAJIAN TINGGI**

**JABATAN MATEMATIK, SAINS & KOMPUTER**

**PEPERIKSAAN AKHIR**

**SESI I : 2022/2023**

**DBM10013 : ENGINEERING MATHEMATICS 1**

**TARIKH : 19 DISEMBER 2022**

**MASA : 8.30 AM – 10.30 AM (2 JAM)**

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Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula & Kertas Graf

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**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**SULIT**

**INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

**ARAHAN:**

*Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab SEMUA soalan.*

**QUESTION 1****SOALAN 1**

CLO1  
C2

(a) Express the following expressions in the simplest form:

*Ungkapkan semula setiap sebutan berikut dalam bentuk termudah:*

i. 
$$\frac{27k^6x^2z^5}{57kx^6z^4}$$

[2 marks]

[2 markah]

ii. 
$$\frac{m}{n} \times \frac{n}{m}$$

[2 marks]

[2 markah]

iii. 
$$\frac{c+2}{3} \div (c^2 + 2c)$$

[3 marks]

[3 markah]

CLO1  
C3

(b) Solve the quadratic equation below by using completing the square method.

*Selesaikan persamaan kuadratik di bawah menggunakan kaedah penyempurnaan kuasa dua.*

$$2x^2 + 4x - 3 = 0$$

[5 marks]

[5 markah]

CLO2  
C3

(c) Construct the partial fraction for the following equations:

*Bina pecahan separa bagi persamaan yang berikut:*

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

[5 marks]

[5 markah]

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

[8 marks]

[8 markah]

## QUESTION 2

## SOALAN 2

CLO1  
C3(a) Given  $R = i + 12$ ,  $S = 5i - 2$  and  $T = -6 - 7i$ . Calculate the following:*Diberi  $R = i + 12$ ,  $S = 5i - 2$  dan  $T = -6 - 7i$ . Kira yang berikut:*

i.  $T + 2R$

[3 marks]

[3 markah]

ii.  $\frac{S}{T}$

[4 marks]

[4 markah]

CLO1  
C3(b) Given  $K = 9 + 2i$  and  $L = -6 + 5i$ .*Diberi  $K = 9 + 2i$  dan  $L = -6 + 5i$ .*

i. Solve  $(K - L)$

*Selesaikan  $(K - L)$* 

[2 marks]

[2 markah]

ii. Compute the modulus and argument for  $(K - L)$

*Kira modulus dan hujah bagi  $(K - L)$* 

[3 marks]

[3 markah]

iii. Sketch Argand Diagram for  $(K - L)$

*Lakarkan Rajah Argand bagi  $(K - L)$* 

[3 marks]

[3 markah]

CLO2  
C3

(c) Solve the following and write the answer in polar form:

*Selesaikan yang berikut dan tulis jawapan dalam bentuk kutub:*

i.  $(2 + 6i) \times (7 \angle 50^\circ)$  [5 marks]

[5 markah]

ii. 
$$\frac{2.75e^{1.75i}}{5(\cos 90^\circ + i\sin 90^\circ)}$$

[5 marks]

[5 markah]

## QUESTION 3

## SOALAN 3

CLO1  
C2

- (a) By referring to matrix  $R = \begin{pmatrix} 1 & 2 & 4 \\ 4 & 8 & 7 \\ 5 & 9 & 5 \end{pmatrix}$ , identify:

Berdasarkan matriks  $R = \begin{pmatrix} 1 & 2 & 4 \\ 4 & 8 & 7 \\ 5 & 9 & 5 \end{pmatrix}$ , kenalpasti:

- i. The elements of  $R_{31}$  and  $R_{12}$

*Elemen bagi  $R_{31}$  dan  $R_{12}$*

[2 marks]

[2 markah]

- ii.  $R^T$

$R^T$

[2 marks]

[2 markah]

CLO1  
C3

- (b) i. Given that  $X = \begin{pmatrix} 1 & 4 & 3 \\ 2 & 7 & 3 \end{pmatrix}$ ,  $Y = \begin{pmatrix} 4 & -2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$  and  $Z = \begin{pmatrix} 1 & 6 & 5 \\ 0 & -2 & 9 \end{pmatrix}$ .

Calculate  $4X - 3Y + Z$ .

*Diberi  $X = \begin{pmatrix} 1 & 4 & 3 \\ 2 & 7 & 3 \end{pmatrix}$ ,  $Y = \begin{pmatrix} 4 & -2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$  dan  $Z = \begin{pmatrix} 1 & 6 & 5 \\ 0 & -2 & 9 \end{pmatrix}$ .*

*Kira nilai  $4X - 3Y + Z$ .*

[4 marks]

[4 markah]

- ii. Calculate the values of  $p$ ,  $q$  and  $r$  in the following matrix equation:

*Kira nilai bagi  $p, q$  dan  $r$  berdasarkan persamaan matrik berikut:*

$$3 \begin{pmatrix} p & 1 \\ 2 & 5 \\ 3 & 2 \end{pmatrix} - \begin{pmatrix} 4 & q \\ 1 & 2 \\ 0 & q \end{pmatrix} = \begin{pmatrix} 3 & 4 \\ 5 & 13 \\ 9 & r \end{pmatrix}$$

[6 marks]

[6 markah]

CLO2  
C3

(c) Solve the following equations using the Cramer's Rule.

*Selesaikan persamaan berikut dengan menggunakan Petua Cramer.*

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

$$2x - y - 3z = -8$$

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

[11 marks]

[11 markah]

## QUESTION 4

## SOALAN 4

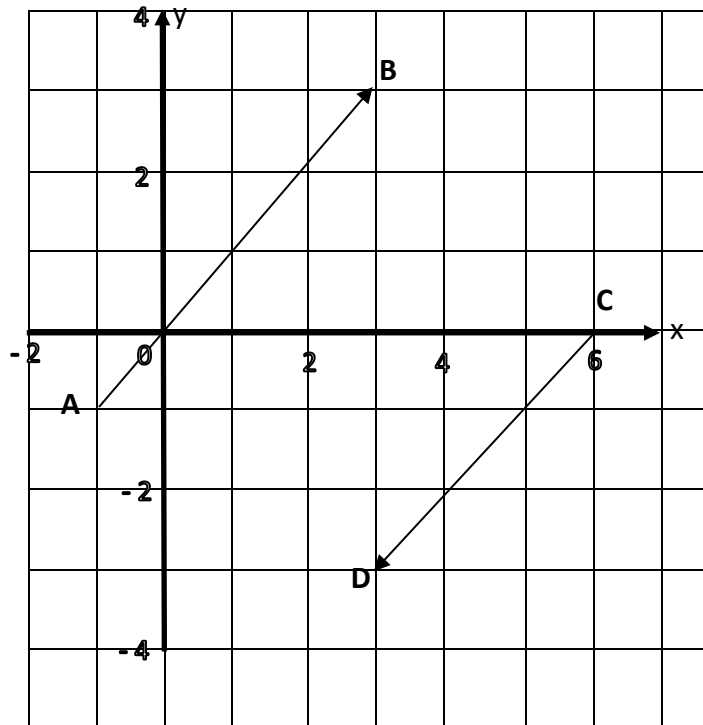


Diagram 4(a) / Rajah 4(a)

CLO1  
C2

(a) The Diagram 4(a) shows the position of vectors in a Cartesian Plane.

*Rajah 4(a) menunjukkan kedudukan vektor di Satah Cartesian.*

i. Represent the notation of both vectors.

*Wakilkan tatatanda untuk kedua-dua vektor.*

[2 marks]

[2 markah]

ii. Express both vectors in  $(x, y)$  form.*Ungkapkan kedua-dua vektor dalam bentuk  $(x, y)$* 

[2 marks]

[2 markah]



- CLO1  
C3
- (b) Given coordinates  $T (2, 4, -3)$  and  $U (5, -2, 3)$ . Calculate:  
*Diberi koordinat  $T (2, 4, -3)$  dan  $U (5, -2, 3)$ . Kirakan:*
- i. Magnitude of  $TU$   
*Magnitud  $TU$*
- [2 marks]  
[2 markah]
- ii. Vector unit for  $TU$   
*Unit vektor bagi  $TU$*
- [1 mark]  
[1 markah]
- CLO1  
C3
- (c) Given that vector  $\vec{P} = 6i + 2j$ ,  $\vec{Q} = 2i - 5j$  and  $\vec{R} = 3i + j$ . Compute:  
*Diberi vektor  $\vec{P} = 6i + 2j$ ,  $\vec{Q} = 2i - 5j$  dan  $\vec{R} = 3i + j$ . Hitungkan:*
- i.  $2\vec{P} + \vec{Q} - 3\vec{R}$  in term of  $i$  and  $j$ .  
 *$2\vec{P} + \vec{Q} - 3\vec{R}$  dalam sebutan  $i$  dan  $j$ .*
- [3 marks]  
[3 markah]
- ii.  $\vec{P} + \vec{Q}$  by using Parallelogram method on a graph paper.  
 *$\vec{P} + \vec{Q}$  menggunakan kaedah Segiempat Selari di atas kertas graf.*
- [5 marks]  
[5 markah]

CLO2  
C3

- (d) Given  $T = 2i - 3j - 6k$ ,  $U = 3i + 5j + 7k$  and  $V = 3i - 5j + 5k$ .  
Calculate:  
*Diberi  $T = 2i - 3j - 6k$ ,  $U = 3i + 5j + 7k$  dan  $V = 3i - 5j + 5k$ . Kira:*

i.  $\overrightarrow{TU}$

[1 mark]

[1 markah]

ii.  $\overrightarrow{UV}$

[1 mark]

[1 markah]

iii.  $\overrightarrow{TU} \cdot \overrightarrow{UV}$

[3 marks]

[3 markah]

iv.  $\overrightarrow{TU} \times \overrightarrow{UV}$

[3 marks]

[3 markah]

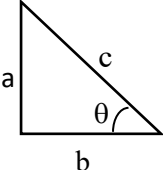
- v. Area of parallelogram
- 
- Luas segiempat selari*

[2 marks]

[2 markah]

SOALAN TAMAT

## FORMULA SHEET FOR DBM10013: ENGINEERING MATHEMATICS 1

<p><b><u>QUADRATIC EQUATION</u></b></p> <ol style="list-style-type: none"> <li><b>Quadratic formula,</b> <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math></li> <li><b>Completing the square,</b>  <math display="block">\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0</math> </li> </ol>	<p><b><u>FORMULA OF TRIANGLE</u></b></p> <ol style="list-style-type: none"> <li><b>Sine Rules;</b> <math>\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}</math></li> <li><b>Cosine Rules;</b> <math>a^2 = b^2 + c^2 - 2bc \cos A</math></li> <li><b>Area of Triangle</b> <math>= \frac{1}{2} ab \sin C</math></li> </ol>
<p><b><u>MATRIX</u></b></p> <ol style="list-style-type: none"> <li><b>Cofactor;</b> <math>C = (-1)^{i+j} M_{ij}</math></li> <li><b>Adjoin;</b> <math>Adj(A) = C^T</math></li> <li><b>Inverse of Matrix;</b> <math>A^{-1} = \frac{1}{ A } Adj(A)</math></li> <li><b>Cramer's Rule;</b>  <math display="block">x = \frac{ A_1 }{ A }, \quad y = \frac{ A_2 }{ A }, \quad z = \frac{ A_3 }{ A }</math> </li> </ol>	<p><b><u>COMPLEX NUMBER</u></b></p> <ol style="list-style-type: none"> <li><b>Modulus of <math>z = \sqrt{a^2 + b^2}</math></b></li> <li><b>Argument of <math>z = \tan^{-1}\left(\frac{b}{a}\right)</math></b></li> <li><b>Cartesian Form;</b> <math>z = a + bi</math></li> <li><b>Polar Form;</b> <math>z = r \angle \theta</math></li> <li><b>Exponential Form;</b> <math>z = r e^{i\theta}</math></li> <li><b>Trigonometric Form;</b> <math>z = r (\cos \theta + i \sin \theta)</math></li> </ol>
<p><b><u>TRIGONOMETRY</u></b></p> <p><b><u>Pythagoras' Theorem</u></b>      <b><u>Trigonometric Identities</u></b></p> <div style="display: flex; align-items: center;"> <div style="flex: 1;">  <p style="text-align: center;"><math>c^2 = a^2 + b^2</math></p> </div> <div style="flex: 2; padding-left: 20px;"> <math display="block">\tan \theta = \frac{\sin \theta}{\cos \theta}</math> <math display="block">\cos^2 \theta + \sin^2 \theta = 1</math> <math display="block">1 + \tan^2 \theta = \sec^2 \theta</math> <math display="block">1 + \cot^2 \theta = \operatorname{cosec}^2 \theta</math> </div> </div>	<p><b><u>VECTOR &amp; SCALAR</u></b></p> <ol style="list-style-type: none"> <li><b>Unit Vector;</b> <math>\hat{u} = \frac{\vec{u}}{ u }</math></li> <li><b>Cos <math>\theta = \frac{\vec{A} \cdot \vec{B}}{ A  B }</math></b></li> <li><b>Scalar Product;</b>  <math display="block">\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2</math> </li> <li><b>Vector Product;</b>  <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><b>Area of parallelogram ABC;</b>  <math display="block"> \vec{AB} \times \vec{BC} </math> </li> </ol>
<p><b><u>COMPOUND-ANGLE</u></b></p> <ol style="list-style-type: none"> <li><math>\sin (A \pm B) = \sin A \cos B \pm \cos A \sin B</math></li> <li><math>\cos (A \pm B) = \cos A \cos B \mp \sin A \sin B</math></li> <li><math>\tan (A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}</math></li> </ol>	<p><b><u>DOUBLE-ANGLE</u></b></p> <ol style="list-style-type: none"> <li><math>\sin 2A = 2 \sin A \cos A</math></li> <li><math>\cos 2A = \cos^2 A - \sin^2 A</math>  <math>= 1 - 2\sin^2 A</math>  <math>= 2\cos^2 A - 1</math> </li> <li><math>\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}</math></li> </ol>