

**SECTION A : 50 MARKS****BAHAGIAN A : 50 MARKAH****INSTRUCTION:**

This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

**ARAHAN:**

*Bahagian ini mengandungi TWO (2) soalan berstruktur. Jawab semua soalan.*

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

CLO1  
C2

a) State each of the following expression in the simplest form:

*Nyatakan setiap ungkapan berikut ke dalam bentuk yang termudah:*

i.  $(m + n)^2 - n(2m - n)$

[2 marks]

[2 markah]

ii.  $\frac{4x + 2}{10x - 2} - \frac{3 - 2x}{1 - 5x}$

[4 marks]

[4 markah]

iii.  $\frac{t + 2}{3t - 9} \div \frac{t^2 - 4t + 4}{t^2 - 6t + 9}$

[4 marks]

[4 markah]

CLO1  
C3

b) Solve the following quadratic equations by using the given method:  
*Selesaikan persamaan kuadratik berikut dengan menggunakan kaedah yang dinyatakan:*

i.  $b^2 = 4b + 21$   
(Factorization)  
(*Pemfaktoran*)

[4 marks]

[4 markah]

ii.  $3t^2 - 4t = 7$   
(Quadratic Formula)  
(*Formula Kuadratik*)

[5 marks]

[5 markah]

iii.  $y^2 + 8y - 2 = 0$   
(Completing the square)  
(*Penyempurnaan kuasa dua*)

[6 marks]

[6 markah]

**QUESTION 2****SOALAN 2**CLO1  
C2

a) Determine the value of A and B for the partial fraction decomposition below:

*Tentukan nilai A dan B bagi penguraian pecahan separa berikut:*

$$\frac{5x+13}{x^2+4x-5} = \frac{A}{(x-1)} + \frac{B}{(x+5)}$$

[4 marks]

[4 markah]

CLO1  
C3

b) Decompose the following fractions into partial fraction:

*Uraikan pecahan berikut kepada pecahan separa:*

i.  $\frac{3x-5}{x^2-x-12}$

[5 marks]

[5 markah]

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

[6 marks]

[6 markah]

iii.  $\frac{3x-5}{(x-1)(x^2+x+1)}$

[6 marks]

[6 markah]

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

[4 marks]

[4 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) Given that the position vectors of point A, B and C with respect to the origin are:  
 $\vec{OA} = 3i + 2j - 4k$ ,  $\vec{OB} = 2i - j + 3k$  and  $\vec{OC} = -i + 3j - 2k$ . Compute

*Diberi kedudukan vektor A, B and C adalah :*

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

i)  $\vec{AB}$

[3 marks]

[3 markah]

ii)  $\vec{BC}$

[3 marks]

[3 markah]

iii)  $\vec{AB} \cdot \vec{BC}$

[4 marks]

[4 markah]

CLO2  
C3

b) Given vectors  $A = 6i - 14j + 4k$  and  $B = 20i + 8j - 2k$ . Calculate  
*Diberi vektor  $A = 6i - 14j + 4k$  dan  $B = 20i + 8j - 2k$ . Kira*

i.  $A - B$

[3 marks]

[3 markah]

ii.  $A \times B$

[3 marks]

[3 markah]

iii.  $|\overrightarrow{AB}|$

[5 marks]

[5 markah]

iv. Prove that the vector  $A$  is perpendicular to vector  $B$ .

*Buktikan vektor  $A$  seranjang kepada vektor  $B$ .*

[4 marks]

[4 markah]

**QUESTION 4****SOALAN 4**CLO2  
C2

- a) i) Represent  $250^\circ$  using a circular diagram and state the quadrant where the angle lies in.

*Tunjukkan  $250^\circ$  dengan menggunakan diagram dan nyatakan sukuan di mana sudut itu berada.*

[2 marks]

[2 markah]

- ii) Given  $\sin A = \frac{3}{5}$ ,  $90^\circ < A < 180^\circ$  and  $\sin B = \frac{12}{13}$ ,  $180^\circ < B < 270^\circ$

Without using a calculator, determine the value of :

*Diberi  $\sin A = \frac{3}{5}$ ,  $90^\circ < A < 180^\circ$  and  $\sin B = \frac{12}{13}$ ,  $180^\circ < B < 270^\circ$*

*Tanpa menggunakan kalkulator, tentukan nilai berikut :*

a.  $\sin(A + B)$

[5 marks]

[5 markah]

b.  $\cos(A - B)$

[3 marks]

[3 markah]

CLO2  
C3

- b) i) Find all the angles between  $0^\circ$  and  $360^\circ$  that satisfy the following.

*Dapatkan semua sudut di antara  $0^\circ$  and  $360^\circ$  yang memenuhi persamaan di bawah :*

$$2 \cos^2 x + \cos x = 0$$

[8 marks]

[8 markah]

ii)

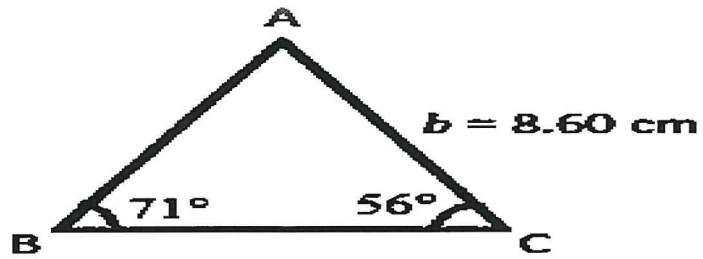


Diagram 4b(ii) / Rajah 4b(ii)

Refer to diagram 4b(ii)

*Merujuk kepada rajah 4b(ii):*

- a. Find the length of  $a$  and  $c$  and angle of  $A$ .  
*Tentukan panjang 'a' dan 'c' dan sudut BAC.*

[5 marks]

[5 markah]

- b. Calculate the area of triangle.  
*Kirakan luas segitiga*

[2 marks]

[2 markah]

**QUESTION 5****SOALAN 5**CLO2  
C2a) i) Given  $u = 3 + 4i$ ,  $v = 1 - 3i$ ,  $w = -2 + 5i$ . Find:*Diberi  $u = 3 + 4i$ ,  $v = 1 - 3i$ ,  $w = -2 + 5i$ . Cari:*

a.  $2u - v$

[3 marks]

[3 markah]

b.  $\vec{uw}$

[4 marks]

[4 markah]

ii) State the following complex number in the form of polar and exponent.

*Nyatakan nombor kompleks berikut dalam bentuk polar dan eksponen.*

$$z = 32(\cos 265^\circ + i \sin 265^\circ)$$

[3 marks]

[3 markah]

CLO2  
C3b) i) Given  $z_1 = 5 - 3i$  and  $z_2 = 3 + 5i$ , find:*Diberi  $z_1 = 5 - 3i$  and  $z_2 = 3 + 5i$ , cari:*

a.  $z_1 z_2$

[3 marks]

[3 markah]

b.  $\frac{z_1^2}{z_2}$

[5 marks]

[5 markah]



- ii) Represent the following complex number on an Argand Diagram and find its modulus and argument.

*Tunjukkan nombor kompleks yang berikut dalam bentuk Argand Diagram dan kirakan modulus dan hujah.*

$$z = 6 - 4i$$

[7 marks]

[7 markah]

### QUESTION 6

#### SOALAN 6

CLO2  
C2

- a) i) Find the value of  $a$  and  $b$  for the following matrices.

*Cari nilai  $a$  dan  $b$  untuk matrik-matrik yang berikut.*

$$\begin{bmatrix} \frac{3}{4}a & -4 \\ -2 & 1 \end{bmatrix} + \begin{bmatrix} \frac{1}{2}a & -1 \\ -3b & 0 \end{bmatrix} = \begin{bmatrix} 5 & -5 \\ 7 & 1 \end{bmatrix}.$$

[6 marks]

[6 markah]

- ii) Given that,  $P = \begin{bmatrix} 1 & 2 \\ 3 & -4 \\ 4 & 3 \end{bmatrix}$  and  $Q = \begin{bmatrix} 2 & -4 & 6 \\ 3 & 2 & 1 \end{bmatrix}$ . Find  $PQ$ .

$$\text{Diberi, } P = \begin{bmatrix} 1 & 2 \\ 3 & -4 \\ 4 & 3 \end{bmatrix} \text{ dan } Q = \begin{bmatrix} 2 & -4 & 6 \\ 3 & 2 & 1 \end{bmatrix}. \text{ Cari } PQ.$$

[4 marks]

[4 markah]

CLO2  
C3

b) i) Given that,  $C = \begin{bmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{bmatrix}$  and  $D = \begin{bmatrix} 0 & -1 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ . Determine:

*Diberi,  $C = \begin{bmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{bmatrix}$  dan  $D = \begin{bmatrix} 0 & -1 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ . Tentukan :*

a.  $C + D^T$

[3 marks]

[3 markah]

b.  $D - C^T$

[3 marks]

[3 markah]

ii) Based on matrix  $R = \begin{bmatrix} 5 & -1 & -2 \\ 2 & -2 & 2 \\ -3 & -4 & -6 \end{bmatrix}$ . Find :

*Berdasarkan matrik  $R = \begin{bmatrix} 5 & -1 & -2 \\ 2 & -2 & 2 \\ -3 & -4 & -6 \end{bmatrix}$ . Cari*

a. Determinant of matrix R  
*Penentu matrik R*

[2 marks]

[2 markah]

b. Minor of matrix R  
*Minor matrik R*

[3 marks]

[3 markah]

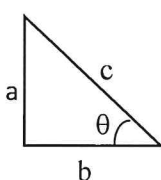
c. Inverse of matrix R  
*Songsangan bagi matrik R*

[4 marks]

[4 markah]

SOALAN TAMAT

## FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

<p><b><u>QUADRATIC EQUATION</u></b></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>,  <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>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><b><u>MATRIX</u></b></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>Adj(A) = C^T</math></li> <li>3. <i>Inverse of Matrix</i>; <math>A^{-1} = \frac{1}{ A } Adj(A)</math></li> <li>4. <i>Cramer's Rule</i>;  <math display="block">x = \frac{ A_1 }{ A }, y = \frac{ A_2 }{ A }, z = \frac{ A_3 }{ A }</math> </li> </ol>	<p><b><u>COMPLEX NUMBER</u></b></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><b><u>TRIGONOMETRY</u></b></p> <p><i>Pythagoras' Theorem</i>      <i>Trigonometric Identities</i></p> <div style="display: flex; align-items: flex-start;"> <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>1. <i>Unit Vector</i>; <math>\hat{u} = \frac{\vec{u}}{ u }</math></li> <li>2. <i>Cosine Rule</i> <math>= \frac{\vec{A} \cdot \vec{B}}{ A  B }</math></li> <li>3. <i>Scalar Product</i>;  <math display="block">\vec{A} \cdot \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><b><u>COMPOUND-ANGLE</u></b></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><b><u>DOUBLE-ANGLE</u></b></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>= 1 - 2\sin^2 A</math>  <math>= 2\cos^2 A - 1</math> </li> <li>3. <math>\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}</math></li> </ol>