

**SULIT**



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI  
KEMENTERIAN PENDIDIKAN MALAYSIA**

**JABATAN MATEMATIK, SAINS & KOMPUTER**

**PEPERIKSAAN AKHIR**

**SESI JUN 2019**

**DBM10013: ENGINEERING MATHEMATICS 1**

**TARIKH : 21 OKTOBER 2019**

**MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)**

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Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.  
Subjektif (4 soalan)

Dokumen sokongan yang disertakan : Formula

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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)** subjective questions. Answer **ALL** questions.

**ARAHAN :**

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

**QUESTION 1****SOALAN 1**CLO1  
C3

(a) Complete each of the following expressions:

*Lengkapkan setiap ungkapan yang berikut:*

i.  $\frac{4a}{a-2} - 1$

[3 marks]

[3 markah]

ii.  $\frac{2x}{x^2 - 4} \div \frac{2}{x - 2}$

[3 marks]

[3 markah]

CLO1  
C3

(b) Solve the following quadratic equations using the given method:

*Selesaikan persamaan kuadratik di bawah dengan menggunakan kaedah yang diberi:*

i.  $x^2 - 6x + 2 = 0$  (Quadratic formula)

(Formula kuadratik)

[3 marks]

[3 markah]

ii.  $3x^2 = 5 + 8x$  (Completing the square)

(Penyempurnaan kuasa dua)

[4 marks]

[4 markah]

CLO2  
C3

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

*Bentukkan pecahan separa bagi persamaan berikut:*

i. 
$$\frac{2(1+x)}{x(x^2+4)}$$

[5 marks]

[5 markah]

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

[7 marks]

[7 markah]

## QUESTION 2

## SOALAN 2

CLO1  
C3

(a) Given that  $P = -4 + 6i$ ,  $Q = 7 - 5i$  and  $R = -6 - 2i$ . Calculate each of the followings in the form of  $a + bi$ .

*Diberi  $P = -4 + 6i$ ,  $Q = 7 - 5i$  dan  $R = -6 - 2i$ . Kirakan setiap yang berikut dalam bentuk  $a + bi$ .*

i.  $P - R$

[2 marks]

[2 markah]

ii.  $2(R + P)$

[2 marks]

[2 markah]

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

[3 marks]

[3 markah]

CLO1  
C3

(b) Given that  $R = 5 - 10i$  and  $S = -8 + 2i$ . Calculate the modulus and the argument. Then, sketch the Argand diagram for  $R + S$ .

*Diberi  $R = 5 - 10i$  dan  $S = -8 + 2i$ . Kirakan modulus dan hujah. Kemudian lakarkan dalam bentuk Gambarajah Argand bagi  $R + S$ .*

[8 marks]

[8 markah]

CLO2  
C3

(c)

- i. Solve the following expression in an exponential form.  
*Selesaikan ungkapan berikut dalam bentuk eksponen.*

$$\frac{10(\cos 200^\circ + i \sin 200^\circ) \times 6(\cos 10^\circ + i \sin 10^\circ)}{20(\cos 70^\circ + i \sin 70^\circ)}$$

[6 marks]

[6 markah]

- ii. Given that  $Z_1 = 10(\cos 12^\circ + i \sin 12^\circ)$  and  $Z_2 = 20 \angle 125^\circ$ . Solve  $\frac{Z_2}{Z_1}$  in trigonometric form.

*Diberi  $Z_1 = 10(\cos 12^\circ + i \sin 12^\circ)$  dan  $Z_2 = 20 \angle 125^\circ$ . Selesaikan  $\frac{Z_2}{Z_1}$*

*dalam bentuk trigonometrik.*

[4 marks]

[4 markah]

## QUESTION 3

## SOALAN 3

CLO1  
C2

(a) Referring to matrix  $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & 4 \\ 2 & 7 & 6 \end{pmatrix}$ , identify the element at:

Berdasarkan matriks  $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & 4 \\ 2 & 7 & 6 \end{pmatrix}$ , kenalpasti unsur pada:

i.  $A_{23}$

[1 mark]

[1 markah]

ii.  $A_{21}$

[1 mark]

[1 markah]

iii.  $A_{31}$

[1 mark]

[1 markah]

iv. State the size of matrix A.

*Nyatakan saiz matriks A.*

[1 mark]

[1 markah]

v. Find  $6A^T$ .

*Dapatkan  $6A^T$ .*

[3 marks]

[3 markah]

CLO1  
C3

(b) Given that  $C = \begin{pmatrix} 2 & 3 & 5 \\ -3 & -1 & 4 \end{pmatrix}$  and  $D = \begin{pmatrix} -1 & 3 \\ 5 & 7 \\ -3 & 2 \end{pmatrix}$ .

Diberi  $C = \begin{pmatrix} 2 & 3 & 5 \\ -3 & -1 & 4 \end{pmatrix}$  dan  $D = \begin{pmatrix} -1 & 3 \\ 5 & 7 \\ -3 & 2 \end{pmatrix}$ .

i. Calculate  $C^T + D$ .

*Cari nilai  $C^T + D$ .*

[4 marks]

[4 markah]

ii. Calculate  $C \times D$

*Cari nilai  $C \times D$*

[4 marks]

[4 markah]

CLO2  
C3

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

*Selesaikan persamaan berikut dengan menggunakan Petua Cramer.*

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

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

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

[10 marks]

[10 markah]

## QUESTION 4

## SOALAN 4

CLO1  
C2

(a) Given that  $\vec{m} = \begin{pmatrix} -3 \\ g \\ 4 \end{pmatrix}$ ,  $\vec{n} = \begin{pmatrix} -1 \\ -1 \\ h \end{pmatrix}$  and  $3\vec{n} - \vec{m} = \begin{pmatrix} 0 \\ -5 \\ 8 \end{pmatrix}$

Diberi  $\vec{m} = \begin{pmatrix} -3 \\ g \\ 4 \end{pmatrix}$ ,  $\vec{n} = \begin{pmatrix} -1 \\ -1 \\ h \end{pmatrix}$  dan  $3\vec{n} - \vec{m} = \begin{pmatrix} 0 \\ -5 \\ 8 \end{pmatrix}$ .

- i. Find the value of g and h.

*Cari nilai g dan h.*

[3 marks]

[3 markah]

- ii. Calculate  $-\vec{n} + \vec{m}$

*Cari nilai  $-\vec{n} + \vec{m}$*

[2 marks]

[2 markah]

- iii. Calculate  $3\vec{m} - \vec{n}$

*Cari nilai  $3\vec{m} - \vec{n}$*

[2 marks]

[2 markah]



CLO1  
C3

(b)

- i. Given that  $P(-3,4)$ . Calculate the unit vector in the direction of  $\overrightarrow{OP}$ .

*Diberi  $P(-3,4)$ . Kirakan vektor unit dalam arah  $\overrightarrow{OP}$ .*

[4 marks]

[4 markah]

- ii. Given that vectors  $\overrightarrow{OP} = -i - 5j - 11k$  and  $\overrightarrow{QR} = -4i - 2j + 3k$ . Express the vectors of  $\overrightarrow{PR}$  and  $\overrightarrow{QR} - \overrightarrow{PQ}$ .

*Diberi  $\overrightarrow{OP} = -i - 5j - 11k$  dan  $\overrightarrow{QR} = -4i - 2j + 3k$ . Tunjukkan vektor  $\overrightarrow{PR}$  dan  $\overrightarrow{QR} - \overrightarrow{PQ}$ .*

[4 marks]

[4 markah]

CLO2  
C3

- (c) A triangle with vertices  $P(2,0,-2)$ ,  $Q(5,-2,3)$  and  $R(0,5,4)$ . Calculate:

*Segitiga dengan sudut  $P(2,0,-2)$ ,  $Q(5,-2,3)$  dan  $R(0,5,4)$ . Kirakan :*

i.  $\overrightarrow{PQ} \bullet \overrightarrow{QR}$

[5 marks]

[5 markah]

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

[3 marks]

[3 markah]

- iii. Area of parallelogram based on the answer (c) ii.

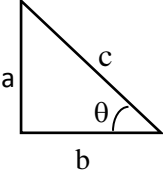
*Luas parallelogram berdasarkan jawapan (c) ii.*

[2 marks]

[2 markah]

SOALAN TAMAT

## FORMULA SHEET FOR ENGINEERING MATHEMATICS 1 (DBM10013)

<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 }, 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><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>