

**SULIT**



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

**JABATAN MATEMATIK, SAINS & KOMPUTER**

**PEPERIKSAAN AKHIR  
SESI DISEMBER 2017**

**DBM1013 : ENGINEERING MATHEMATICS 1**

**TARIKH : 09 APRIL 2018  
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 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 question. Answer **ALL** questions.

**ARAHAN:**

*Bahagian ini mengandungi DUA (2) soalan struktur. Jawab SEMUA soalan.*

**QUESTION 1****SOALAN 1**CLO1  
C2

- a) Simplify each of the following as a single fraction in the lowest terms.

*Permudahkan setiap sebutan berikut sebagai pecahan tunggal dalam sebutan terendah.*

i. 
$$\frac{7p^4q^3z}{28p^2q^5}$$

[2 marks]

[2 markah]

ii. 
$$\frac{2}{m-3} + \frac{1}{3-m}$$

[3 marks]

[3 markah]

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

[5 marks]

[5 markah]

CLO1  
C3

a) Solve the quadratic equations. ✎

*Selesaikan persamaan-persamaan kuadratik berikut.*

i.  $5x^2 - 7x - 6 = 0$  (By using factorization method)

[3 marks]

[3 markah]

ii.  $2x^2 + 3x = 5$  (By using quadratic formula)

[5 marks]

[5 markah]

iii.  $4x^2 + 8x + 3 = 0$  (By using completing the square)

[7 marks]

[7 markah]

## QUESTION 2

## SOALAN 2

CLO1  
C2

a) Express the fraction in partial fractions.

*Nyatakan pecahan yang berikut kepada pecahan separa.*

$$\frac{x^2 - 1}{x - 2}$$

[4 marks]

[4 markah]

CLO1  
C3

b) Solve the following partial fractions.

*Selesaikan pecahan separa berikut.*

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

[5 marks]

[5 markah]

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

[5 marks]

[5 markah]

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

[5 marks]

[5 markah]

iv. 
$$\frac{x^2+2x+1}{(2x^2-5x+7)(x+1)}$$

[6 marks]

[6 markah]

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

This section consists of **FOUR (4)** structured question. Answer **TWO (2)** questions only.

**ARAHAN:**

*Bahagian ini mengandungi EMPAT (4) soalan struktur. Jawab DUA (2) soalan sahaja.*

**QUESTION 3****SOALAN 3**CLO2  
C2

- a) A triangle has vertices  $P = (2, -1, 0)$ ,  $Q = (3, 4, 1)$  and  $R = (0, 3, -2)$ . Determine the area for a triangle of  $PQR$ .

*Sebuah segitiga mempunyai sudut  $P = (2, -1, 0)$ ,  $Q = (3, 4, 1)$  dan  $R = (0, 3, -2)$ .*

*Tentukan luas bagi segitiga  $PQR$ .*

[10 marks]

[10 markah]

CLO2  
C3

- b) If position vectors  $\vec{OA}$ ,  $\vec{OB}$  and  $\vec{OC}$  are defined by  $\vec{OA} = 4i - j + 2k$ ,  $\vec{OB} = 3i + j + 3k$ , and  $\vec{OC} = i - k$ . Calculate:

*Sekiranya kedudukan vektor-vektor  $\vec{OA}$ ,  $\vec{OB}$  dan  $\vec{OC}$  ditakrifkan sebagai*

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

- i. Vector  $\vec{AB}$

Vektor  $\vec{AB}$

[3 marks]

[3 markah]

- ii. Vector  $\vec{BC}$

Vektor  $\vec{BC}$

[3 marks]

[3 markah]

- iii. Vector  $\vec{AC}$

Vektor  $\vec{AC}$

[3 marks]

[3 markah]

- iv.  $\vec{OA} \times (\vec{OB} \times \vec{OC})$

[6 marks]

[6 markah]

## QUESTION 4

## SOALAN 4

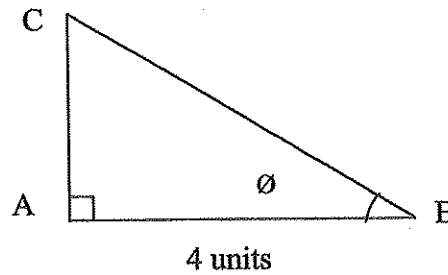


Diagram 5(a)

Rajah 5 (a)

CLO2  
C2

a) Referring to Diagram 5(a), given that  $\cot \phi = 0.577$  and  $AB = 4$  units. Determine:

*Merujuk kepada rajah 5(a), diberi  $\cot \phi = 0.577$  dan  $AB = 4$  units. Tentukan:*

i. The value of the angle,  $\phi$

[3 marks]

[3 markah]

ii. The perimeter of the triangle.

[7 marks]

[7 markah]

CLO2  
C3

b) Solve the following equations for  $0^\circ \leq \theta \leq 360^\circ$  :

*Selesaikan persamaan trigonometri berikut untuk  $0^\circ \leq \theta \leq 360^\circ$  :*

i.  $2 \cos^2 \theta - \sin^2 \theta = 4 \sin \theta - 2$

[7 marks]

[7 markah]

ii.  $9 \tan \theta + \tan^2 \theta = 5 \sec^2 \theta - 3$

[8 marks]

[8 markah]

## QUESTION 5

## SOALAN 5

CLO2  
C2

- a) Given  $P = 12\angle 125^\circ$ ,  $Q = -5 - 3i$  and  $R = -2 + i$ . Compute the following in Cartesian form.

*Diberi  $P = 12\angle 125^\circ$ ,  $Q = -5 - 3i$  dan  $R = -2 + i$ . Kira nombor kompleks berikut dalam bentuk cartesian :*

i.  $Q - R$

[2 marks]

[2 markah]

ii.  $2PQ$

[4 marks]

[4 markah]

iii.  $\frac{1}{3Q} + R$

[4 marks]

[4 markah]



CLO2  
C3b) If  $Z_1=1+i$ ,  $Z_2=2-i$  and  $Z_3=3+2i$ , express the following in the form of  $a + bi$ .

Jika  $Z_1=1+i$ ;  $Z_2=2-i$  dan  $Z_3=3+2i$ ; ungkapkan yang berikut dalam sebutan  $a + bi$ .

i.  $4Z_1 + Z_2$

[2 marks]

[2 markah]

ii.  $\frac{1}{Z_1} + \frac{1}{Z_3}$

[4 marks]

[4 markah]

iii.  $\frac{Z_1 + 2i}{1 + Z_2 i}$

[4 marks]

[4 markah]

iv.  $\frac{Z_3 - Z_2}{2 - Z_1 i}$

[5 marks]

[5 markah]

## QUESTION 6

## SOALAN 6

CLO2  
C2

a) Given matrices,  $A = \begin{bmatrix} 2 & 5 \\ 0 & -1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 5 \\ 3 \\ 9 \end{bmatrix}$ ,  $C = [-7 \ 1 \ 5]$ ,  $D = \begin{bmatrix} 3 \\ 8 \end{bmatrix}$  and

$$E = [1 \ 9].$$

Diberi matrik,  $A = \begin{bmatrix} 2 & 5 \\ 0 & -1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 5 \\ 3 \\ 9 \end{bmatrix}$ ,  $C = [-7 \ 1 \ 5]$ ,  $D = \begin{bmatrix} 3 \\ 8 \end{bmatrix}$  dan

$$E = [1 \ 9].$$

Determine:

Tentukan:

i. EA

[2 marks]

[2 markah]

ii. ED

[2 marks]

[2 markah]

iii. BC

[3 marks]

[3 markah]

iv. AD

[3 marks]

[3 markah]

CLO2  
C3

b) Solve the following equations by using the inverse matrix method:

*Selesaikan persamaan matriks berikut dengan menggunakan kaedah matriks songsangan:*

$$4x + 3y - 2z = 7$$

$$x + y = 5$$

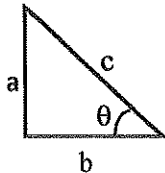
$$3x + z = 4$$

[15 marks]

[15 markah]

SOALAN TAMAT

**FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)**

<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 = re^{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>  $c^2 = a^2 + b^2$ $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$	<p><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>