

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2015

DBM1013: ENGINEERING MATHEMATICS 1

TARIKH : 21 OKTOBER 2015

MASA : 2.30 PM - 4.30 PM (2 JAM)

Kertas ini mengandungi DUA BELAS (12) halaman bercetak.

Bahagian A: Struktur (3 soalan, jawab SEMUA)

Bahagian B: Struktur (3 soalan, jawab 1 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 75 MARKS

BAHAGIAN A : 75 MARKAH

INSTRUCTION:

This section consists of **THREE (3)** structured questions. Answer **ALL** questions.

ARAHAN :

Bahagian ini mengandungi **TIGA (3)** soalan berstruktur. Jawab **SEMUA** soalan.

QUESTION 1

SOALAN 1

- a) Simplify the following expressions to the lowest term.

Permudahkan ungkapan berikut kepada sebutan terendah.

i.
$$\frac{2xyz}{5a} \div \frac{8xy^2}{20ab}$$

[2 marks]

[2 markah]

ii.
$$\frac{c+d}{e^2} \times \frac{e^4}{c^2-d^2}$$

[3 marks]

[3 markah]

iii.
$$\left(\frac{3}{a+3} - \frac{4}{a+4} \right) \times \left(\frac{a+4}{a} \right)$$

[5 marks]

[5 markah]

CLO2
C3

b) Solve the following quadratic equations.

Selesaikan persamaan kuadratik berikut.

i. $3x^2 = 4 - 8x$ (By using the quadratic formula.)

[6 marks]

[6 markah]

ii. $2x^2 + 5x - 3 = 0$ (By using the completing the square.)

[9 marks]

[9 markah]

QUESTION 2
SOALAN 2CLO2
C1

- a) State the order of matrix and form the transposition of matrix P and Q:

$$P = \begin{bmatrix} 1 & 3 \\ 2 & 2 \\ 3 & 3 \\ 4 & 4 \end{bmatrix}, \quad Q = \begin{bmatrix} 2 & -1 & 3 \\ 9 & 10 & 5 \end{bmatrix}$$

Nyatakan peringkat bagi matrik dan dapatkan tansposisi bagi matrik P dan Q:

$$P = \begin{bmatrix} 1 & 3 \\ 2 & 2 \\ 3 & 3 \\ 4 & 4 \end{bmatrix}, \quad Q = \begin{bmatrix} 2 & -1 & 3 \\ 9 & 10 & 5 \end{bmatrix}$$

[4 marks]

[4 markah]

CLO2
C2

b) Given matrix ,

$$A = \begin{bmatrix} 3 & 5 \\ 1 & 3 \end{bmatrix}, B = \begin{bmatrix} 0 & -2 \\ 5 & 3 \end{bmatrix}, C = \begin{bmatrix} 1 & -2 & 4 \\ 3 & 5 & 2 \end{bmatrix} \text{ and } D = \begin{bmatrix} 4 & 7 & 8 \\ -2 & 4 & 4 \\ 0 & 3 & 5 \end{bmatrix}$$

Di beri matrik ,

$$A = \begin{bmatrix} 3 & 5 \\ 1 & 3 \end{bmatrix}, B = \begin{bmatrix} 0 & -2 \\ 5 & 3 \end{bmatrix}, C = \begin{bmatrix} 1 & -2 & 4 \\ 3 & 5 & 2 \end{bmatrix} \text{ and } D = \begin{bmatrix} 4 & 7 & 8 \\ -2 & 4 & 4 \\ 0 & 3 & 5 \end{bmatrix}$$

find:

cari:

i) $|A|$

[2 marks]

[2markah]

ii) $(A + B)$

[2 marks]

[2 markah]

ii) $B^T - 2A$

[3 marks]

[3 markah]

iii) $3CD$

[3 marks]

[3 markah]

CLO2
C3

c) Solve the following equation by using the inverse matrix method.

Selesaikan persamaan berikut dengan menggunakan kaedah matrix songsang.

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

$$2x + 4y - 3z = 1$$

$$3x + 6y - 5z = 0$$

[11 marks]

[11 markah]

QUESTION 3
SOALAN 3

CLO2
C2

- (a) Given that $\tilde{p} = -3i + 9j$ and $\tilde{q} = 3i - 5j$, find each of the following vector.
Diberi $\tilde{p} = -3i + 9j$ dan $\tilde{q} = 3i - 5j$, dapatkan vektor bagi setiap yang berikut.

i. $\tilde{p} + \tilde{q}$

[2 marks]
[2markah]

ii. $\tilde{q} - \tilde{p}$

[2 marks]
[2markah]

CLO2
CLO2
C3

- (b) Given that vector \overrightarrow{OP} is $\begin{pmatrix} -3 \\ 2 \\ 5 \end{pmatrix}$ and vector \overrightarrow{OQ} is $\begin{pmatrix} -2 \\ 4 \\ -6 \end{pmatrix}$. Find:

Diberikan bahawa vektor \overrightarrow{OP} ialah $\begin{pmatrix} -3 \\ 2 \\ 5 \end{pmatrix}$ dan vector \overrightarrow{OQ} ialah $\begin{pmatrix} -2 \\ 4 \\ -6 \end{pmatrix}$. Dapatkan:

i) $2\overrightarrow{OP} \cdot \overrightarrow{OQ}$

[3 marks]
[3 markah]

ii) $\overrightarrow{OP} \times \overrightarrow{OQ}$

[3 marks]
[3 markah]

- (c) Calculate the angle between the vectors $2i + 3j - k$ and $3i - 5j + 2k$.
Kirakan sudut antara vektor $2i + 3j - k$ dan $3i - 5j + 2k$.

[4 marks]
[4 markah]

- (d) Given, vectors $\overline{OC} = i - j - 2k$, $\overline{OD} = i - 3j - k$ and $\overline{OE} = 4i - 4j + 4k$. Calculate:
Diberi vector $\overline{OC} = i - j - 2k$, $\overline{OD} = i - 3j - k$ dan $\overline{OE} = 4i - 4j + 4k$. Kirakan:

$$2\overline{CD} \cdot 3\overline{DE}$$

[7 marks]

[7 markah]

- (e) Given vectors $\overline{OM} = (2, -1, 3)$ and $\overline{ON} = (0, 1, 7)$. Find unit vector in the direction of \overline{MN} . :

Diberi vector $\overline{OM} = (2, -1, 3)$ dan $\overline{ON} = (0, 1, 7)$. Dapatkan unit vector bagi arah \overline{MN} . :

[4 marks]

[4 markah]

SECTION B: 25 MARKS

BAHAGIAN B: 25 MARKAH

INSTRUCTION:

This section consists of THREE (3) structured questions. Answer ONE (1) question only.

ARAHAN:

Bahagian ini mengandungi TIGA (3) soalan berstruktur. Jawab SATU (1) soalan sahaja.

QUESTION 4

SOALAN 4

- a) Express each of the following in partial fractions.

Nyatakan pecahan yang berikut kepada pecahan separa.

$$\frac{x+7}{(x-2)(x-5)}$$

[4 marks]

[4 markah]

- b) Solve the following partial fractions:

Selesaikan pecahan separa berikut:

i.
$$\frac{18x+20}{(3x+4)^2}$$

[6 marks]

[6 markah]

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

[7 marks]

[7 markah]

iii.
$$\frac{4x^2-47x+141}{x^2-13x+40}$$

[8 marks]

[8 markah]

CLO1
C2

CLO1
C3

QUESTION 5

SOALAN 5

CLO1
C2

- a) Find all the angle for the trigonometric equation below for the range $0^\circ \leq x \leq 360^\circ$.

Cari semua sudut untuk persamaan trigonometri di bawah bagi julat $0^\circ \leq x \leq 360^\circ$.

i. $\cos x - 3\sin x = 0$

[5 marks]

[5 markah]

ii. $4 \cos x = 2 \cot x$

[5 marks]

[5 markah]

CLO1
C3

- b) Prove each of the following trigonometric identities.

(Use the equation on the right to prove the identity of the equation on the left).

Buktikan setiap identiti trigonometri berikut.

(Gunakan persamaan di sebelah kanan untuk membuktikan identity persamaan di sebelah kiri).

i. $\cot A - \tan A = 2 \cot 2A$

[5 marks]

[5 markah]

ii. $\frac{\sin A}{\sin B} + \frac{\cos A}{\cos B} = \frac{2 \sin(A+B)}{\sin 2B}$

[5 marks]

[5 markah]

iii. $\operatorname{cosec} A = (\cot A + \tan A) \cos A$

[5 marks]

[5 markah]

QUESTION 6

SOALAN 6

CLO1
C2

- a) Given $x = 4 + i$, $w = -1 + 2i$ and $z = 2 - 6i$. Express each of the following in the form of $a + bi$

Diberi persamaan $x = 4 + i$, $w = -1 + 2i$ dan $z = 2 - 6i$. Ungkapkan persamaan berikut dalam bentuk $a + bi$

i. $3x + 2w$

[3 marks]

[3 markah]

ii. $x \times w$

[3 marks]

[3 markah]

iii. $\frac{x}{z}$

[4 marks]

[4 markah]

CLO1
C3

- b) Given $J = 5 - 5i$, $K = -3 + i$. Find the modulus, the argument and sketch the Argand's diagram for :

Diberi $J = 5 - 5i$, $K = -3 + i$. Dapatkan modulus, hujah dan lakarkan gambarajah Argand's bagi:

i. J

[6 marks]

[6 markah]

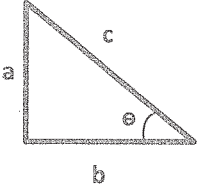
ii. $\frac{J}{K}$

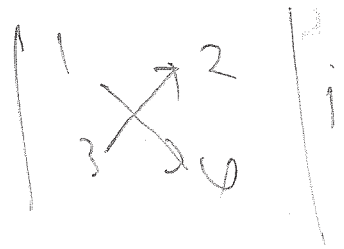
[9 marks]

[9 markah]

SOALAN TAMAT

FORMULA

<p><u>QUADRATIC EQUATION</u></p> $X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $\left(x + \frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$	<p><u>FORMULA OF TRIANGLE</u></p> <p><i>Sine Rules</i>; $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$</p> <p><i>Cosine Rules</i>; $a^2 = b^2 + c^2 - 2bc \cos A$</p> <p><i>Area of Triangle</i> = $\frac{1}{2} ab \sin C$</p>
<p><u>MATRIX</u></p> <p><i>Cofactor</i>, $C = (-1)^{(i+j)} M_{ij}$</p> <p><i>Adjoin</i>, $Adj(A) = C^T$</p> <p><i>Inverse of Matrix</i>, $A^{-1} = \frac{1}{ A } Adj(A)$</p>	<p><u>COMPLEX NUMBER</u></p> <p><i>Modulus of z</i> = $\sqrt{a^2 + b^2}$</p> <p><i>Argument of z</i> = $\tan^{-1} \left(\frac{b}{a}\right)$</p> <p><i>Cartesian Form</i>; $z = a + bi$</p> <p><i>Polar Form</i>; $z = r \angle \theta$</p> <p><i>Exponential Form</i>; $z = re^{i\theta}$</p>
<p><u>TRIGONOMETRY</u></p> <p><u>Pythagoras' Theorem</u> <u>Trigonometry Identities</u></p>  $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $1 + \tan^2 \theta = \sec^2 \theta$ $c^2 = a^2 + b^2$ $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$	<p><u>VECTOR & SCALAR</u></p> <p><i>Unit Vector</i>, $\hat{u} = \frac{u}{ u }$</p> $\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$ $\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$ <p><i>Area of parallelogram ABC</i> = $\vec{AB} \times \vec{BC}$</p>
<p><u>COMPOUND-ANGLE</u></p> $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$ $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$	<p><u>DOUBLE-ANGLE</u></p> $\sin 2A = 2 \sin A \cos A$ $\cos 2A = \cos^2 A - \sin^2 A$ $= 1 - 2 \sin^2 A$ $= 2 \cos^2 A - 1$ $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$



$$(4 - 0)i$$