SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2016

DBM1013: ENGINEERING MATHEMATICS 1

TARIKH : 31 OKTOBER 2016
MASA : 8.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.
Bahagian A: Struktur (3 soalan)
Bahagian B: Struktur (3 soalan)
Dokumen sokongan yang disertakan : Kertas Graf,Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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 struktur. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO 1
C2

(a) Simplify each of the following equations into a single algebraic fraction.
Permudahkan setiap persamaan yang berikut ke dalam pecahan algebra tunggal.

i. $\frac{2}{x-3} - \frac{4}{x-1}$ [3 marks]
[*3 markah*]

ii. $\frac{x^2-1}{x^2-4} \div \frac{x^2+2x+1}{x^2+4x+4}$ [4 marks]
[*4 markah*]

iii. $\frac{8}{4q-4} \times \frac{q^2-q}{p}$ [3 marks]
[*3 markah*]

CLO 1
C3

(b) Solve the following quadratic functions below using the specific method
Selesaikan fungsi kuadratik di bawah dengan menggunakan kaedah yang dinyatakan

i. $(3x+1)(x-1)=15$ (Factorization Method)
(*Kaedah Pemfaktoran*)
[5 marks]
[*5 markah*]

ii. $18x^2+27x-35=0$ (Quadratic Formula)
(*Kuadratik Formula*)
[5 marks]
[*5 markah*]

iii. $4x^2-9x=0$ (Completing The Square Method)
(*Kaedah Melengkapkan Kuasa Dua*)
[5 marks]
[*5 markah*]

QUESTION 2
SOALAN 2

CLO1
C2

(a) Solve the partial fractions for $\frac{4x+9}{(x+6)(x-3)}$. [5 marks]
Selesaikan pecahan separa bagi $\frac{4x+9}{(x+6)(x-3)}$. [*5 markah*]

CLO1
C3

(b) Given that partial fraction of $\frac{4x^2}{(x-1)(x^2-4x+4)}$ are
$\frac{A}{x-1}+\frac{B}{(x-2)}+\frac{C}{(x-2)^2}$. Find the values of A, B and C.

Diberi pecahan separa bagi $\frac{4x^2}{(x-1)(x^2-4x+4)}$ *ialah*
$\frac{A}{x-1}+\frac{B}{(x-2)}+\frac{C}{(x-2)^2}$. *Cari nilai bagi A, B dan C.*
[9 marks]
[*9 markah*]

CLO1
C3

(c) Express $\frac{x^5+4}{x^3-2x}$ into partial fraction.
Nyatakan $\frac{x^5+4}{x^3-2x}$ kepada pecahan separa.
[11 marks]
[*11 markah*]

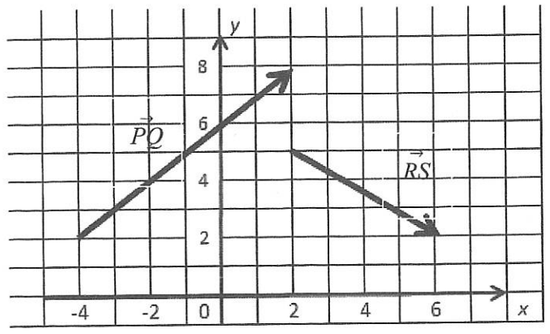
QUESTION 3

SOALAN 3

CLO2 C2

(a) The diagram below shows the vectors of $\vec{PQ}$ and $\vec{RS}$ in a Cartesian plane.

Rajah di bawah menunjukkan vector $\vec{PQ}$ dan $\vec{RS}$ dalam Rajah Cartesian.



i. Express each of these vectors in the $xi + yi$ form. [2 marks]

Ungkapkan setiap vector tersebut dalam bentuk $xi + yi$. [*2 markah*]

ii. Determine the value of $\vec{RS} - \vec{PQ}$ [3 marks]

Tentukan nilai bagi $\vec{RS} - \vec{PQ}$ [*3 markah*]

iii. Calculate the unit vector of $\vec{RS}$ [5 marks]

Kirakan vector unit bagi $\vec{RS}$ [*5 markah*]

CLO2 C3

(b) Given A, B, C and D are the points with coordinates $(-1,4,3)$, $(7,2,-3)$, $(4,2,2)$, and $(6,-3,5)$ respectively. Calculate:

Diberi A, B, C and D adalah titik-titik pada koordinat $(-1,4,3)$, $(7,2,-3)$, $(4,2,2)$, *dan* $(6,-3,5)$*masing-masing. Kirakan:*

i. $\vec{AD}$

[2 marks]

[*2 markah*]

ii. $\left|\vec{CB}\right|$

[4 marks]

[*4 markah*]

iii. $\vec{AD} \times \vec{CB}$

[4 marks]

[*4 markah*]

iv. $\vec{CB} \bullet (\vec{AD} - \vec{CB})$

[5 marks]

[*5 markah*]

SECTION B : 25 MARKAH

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 struktur. Jawab **SATU(1)** soalan sahaja.*

QUESTION 4

SOALAN 4

CLO2
C2

(a) Given $\cos\theta = \frac{3}{5}$ .Without using the calculator, find the values of the following:

Diberi $kos\,\theta = \frac{3}{5}$. *Tanpa menggunakan kalkulator, dapatkan nilai- nilai berikut:*

i) $\sin\theta$

[2 marks]
[*2 markah*]

ii) $\tan\theta$

[2 marks]
[*2 markah*]

iii) $\sec\theta$

[3 marks]
[*3 markah*]

iv) $\cot\theta$

[3 marks]
[*3 markah*]

CLO 2
C3

(b) Find the angles between $0^\circ \le \theta \le 360^\circ$.

Dapatkan sudut - sudut di antara $0^\circ \le \theta \le 360^\circ$.

i) $\cos\theta = 0.8660$ [4 marks]
[*4 markah*]

ii) $6sec^2\theta - 8 = tan\theta$ [11 marks]
[*11 markah*]

QUESTION 5

SOALAN 5

CLO2 C2

(a) Solve each of the following complex numbers in the form of $a + bi$.

Selesaikan setiap nombor kompleks berikut dalam bentuk $a + bi$.

i. $(2 - 5i) - (3 + 4i)$ [2 marks]

[*2 markah*]

ii $(-5 + i) + (12 - 3i)$ [2 marks]

[*2 markah*]

iii. $\dfrac{(3 + 2i)(5 - 3i)}{4 - 5i}$ [6 marks]

[*6 markah*]

CLO2 C3

(b) Given that $Z_1 = 8(\cos 20° + i \sin 20°)$ and $Z_2 = 16e^{0.5236i}$.

Diberi $Z_1 = 8(\cos 20° + i \sin 20°)$ *dan* $Z_2 = 16e^{0.5236i}$.

i) Find the modulus and argument Z_2. [3 marks]

Dapatkan modulus dan Argumen Z_2. [3 *markah*]

ii) Express Z_2 in Cartesian form. [2 marks]

Nyatakan Z_2 *dalam bentuk Cartesian.* [*2 markah*]

iii) Find $Z_1 \times Z_2$ and express the answer in Cartesian form. [5 marks]

Cari $Z_1 \times Z_2$ *dan nyatakan jawapan dalam bentuk Cartesian.* [*5 markah*]

iv) Find $\dfrac{z_2}{z_1}$ and express the answer in Cartesian form. [5 marks]

Cari $\dfrac{z_2}{z_1}$ *dan nyatakan jawapan dalam bentuk Cartesian.* [*5 markah*]

QUESTION 6

SOALAN 6

CLO2 C2

(a) Given the matrix below,

$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 3 & 0 & 2 \\ 1 & -1 & 4 \end{pmatrix}$ and $C = \begin{pmatrix} 6 & 2 \\ 1 & 3 \\ 0 & -2 \end{pmatrix}$

Di beri matrik seperti di bawah,

$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 3 & 0 & 2 \\ 1 & -1 & 4 \end{pmatrix}$ and $C = \begin{pmatrix} 6 & 2 \\ 1 & 3 \\ 0 & -2 \end{pmatrix}$

Calculate :

Kira :

i. $(A - B)$

[2 marks]

[2 *markah*]

ii. $-C^T$

[2 marks]

[*2 markah*]

iii. $3B^T + C$

[3 marks]

[3 *markah*]

iv. AC

[3 marks]

[3 *markah*]

CLO2
C3

(b) Solve the following equation by using the inverse matrix method.

Selesaikan persamaan berikut dengan menggunakan kaedah matrik songsang.

$$2x - 4y + 3z = -3$$
$$x + 2y - 5z = 9$$
$$-3x - y + 2z = -9$$

[15 marks]

[15 *markah*]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

QUADRATIC EQUATION

1. ***Quadratic formula,*** $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
2. ***Completing the square,***

$$\left(x+\frac{b}{2}\right)^2 - \left(\frac{b}{2}\right)^2 + c = 0$$

FORMULA OF TRIANGLE

1. ***Sine Rules;*** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
2. ***Cosine Rules;*** $a^2 = b^2 + c^2 - 2bc\cos A$
3. ***Area of Triangle*** $= \frac{1}{2}ab\sin C$

MATRIX

1. ***Cofactor;*** $C = (-1)^{i+j}M_{ij}$
2. ***Adjoin;*** $Adj(A) = C^T$
3. ***Inverse of Matrix;*** $A^{-1} = \frac{1}{|A|}Adj(A)$
4. ***Cramer's Rule;***

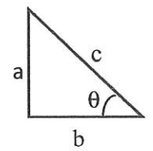
$$x = \frac{|A_1|}{|A|}, y = \frac{|A_2|}{|A|}, z = \frac{|A_3|}{|A|}$$

COMPLEX NUMBER

1. ***Modulus of*** $z = \sqrt{a^2+b^2}$
2. ***Argument of*** $z = tan^{-1}\left(\frac{b}{a}\right)$
3. ***Cartesian Form;*** $z = a + bi$
4. ***Polar Form;*** $z = r\angle\theta$
5. ***Exponential Form;*** $z = re^{i\theta}$
6. ***Trigonometric Form;*** $z = r(\cos\theta + \mathrm{i}\sin\theta)$

TRIGONOMETRY

Pythagoras' Theorem



$$c^2 = a^2 + b^2$$

Trigonometric Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$
$$cos^2\theta + sin^2\theta = 1$$
$$1 + tan^2\theta = sec^2\theta$$
$$1 + cot^2\theta = cosec^2\theta$$

VECTOR & SCALAR

1. ***Unit Vector;*** $\hat{u} = \frac{\bar{u}}{|u|}$
2. ***Cos θ*** $= \frac{\bar{A} \bullet \bar{B}}{|A||B|}$
3. ***Scalar Product;***

$$\vec{A} \bullet \vec{B} = a_1a_2 + b_1b_2 + c_1c_2$$

4. ***Vector Product;***

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

5. ***Area of parallelogram ABC;***

$$\left|\overrightarrow{AB} \times \overrightarrow{BC}\right|$$

COMPOUND-ANGLE

1. $sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$
2. $cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$
3. $tan(A \pm B) = \frac{tan\ A \pm tan\ B}{1 \mp \tan A\tan B}$

DOUBLE-ANGLE

1. $\sin 2A = 2\sin A\cos A$
2. $\cos 2A = cos^2A - sin^2A$
   $= 1 - 2sin^2A$
   $= 2cos^2A - 1$
3. $\tan 2A = \frac{2\tan A}{1 - tan^2A}$