SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2014

DBM1013 : ENGINEERING MATHEMATICS 1

TARIKH : 27 OKTOBER 2014
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 : 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

CLO1
C2

(a) Simplify the following algebra expression
Permudahkan persamaan algebra berikut

i. $\frac{8x^3y^4}{2x^2y}$ [3 marks]
[*3 markah*]

ii. $\frac{8a^2}{16ab}$ [2 marks]
[*2 markah*]

iii. $\frac{4a^2+2a}{2a+1}$ [2 marks]
[*2 markah*]

iv. $x(z-4x)+x(2z+5x)$ [3 marks]
[*3 markah*]

CLO2
C3

(b) Find the value of the variable for the following quadratic equations:

Cari nilai pembolehubah bagi persamaan kuadratik berikut:

i. $2x^2 + 13x + 15 = 0$ by using **Factorization**

$2x^2 + 13x + 15 = 0$ *menggunakan* ***Kaedah Pemfaktoran***

[4 marks]

[*4 markah*]

ii. $4x^2 + 5 = -9x$ by using **Completing The Square**

$4x^2 + 5 = -9x$ *menggunakan* ***Kaedah Penyempurnaan Kuasa Dua***

[7 marks]

[*7 markah*]

iii. $8 = 2x^2 - 5x$ by using **Quadratic Formula**

$8 = 2x^2 - 5x$ *menggunakan* ***Rumus Kuadratik***

[4 marks]

[*4 markah*]

QUESTION 2
SOALAN 2

CLO1 C1

(a) i. State the order of a matrix. [1 mark]
Apakah peringkat suatu matriks. [*1 markah*]

ii. List 3 types of matrices. [3 marks]
Senaraikan tiga jenis matriks. [*3 markah*]

CLO2 C3

(b) Given that, $S = \begin{pmatrix} -1 & 5 \\ 4 & -5 \\ 0 & 3 \end{pmatrix}$ and $T = \begin{pmatrix} 4 & -2 & 1 \\ 5 & 7 & 9 \end{pmatrix}$. Determine:

Diberi bahawa, $S = \begin{pmatrix} -1 & 5 \\ 4 & -5 \\ 0 & 3 \end{pmatrix}$ *dan* $T = \begin{pmatrix} 4 & -2 & 1 \\ 5 & 7 & 9 \end{pmatrix}$. *Tentukan:*

i. $S - T^T$ [3 marks]
[*3 markah*]

ii. $T + S^T$ [3 marks]
[*3 markah*]

CLO2 C3

(c) Solve the simultaneous equation below using Inverse Matrices Method. [15 marks]

Selesaikan persamaan serentak di bawah menggunakan Kaedah Songsangan Matrik. [*15 markah*]

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

QUESTION 3
SOALAN 3

CLO1 C2

(a) Diagram below shows the vector $\overrightarrow{OA} = \underline{a}$. By using graph paper, draw the following vectors when:

Rajah di bawah menunjukkan vektor $\overrightarrow{OA} = \underline{a}$. *Dengan menggunakan kertas graf, lukiskan vektor yang berikut apabila:*

i. $\overrightarrow{OP} = 2\underline{a}$ [2 marks]
[2 *markah*]

ii. $\overrightarrow{OQ} = -\frac{1}{2}\underline{a}$ [2 marks]
[2 *markah*]

CLO2 C2

(b) If $p = 2i - j + 2k$ and $q = -3i + 2j - 4k$, express the following in terms of i, j and k:

Jika $p = 2i - j + 2k$ dan $q = -3i + 2j - 4k$, *nyatakan yang berikut dalam sebutan i, j dan k:*

i. $p + q$ [3 marks]
[3 *markah*]

ii. $2p - 3q$ [3 marks]
[3 *markah*]

CLO2
C3

(c) Given that $A(3,-6,7)$, $B(3,2,-3)$ and $C(-2,8,-8)$. Find:

Diberi $A(3,-6,7)$, $B(3,2,-3)$ *dan* $C(-2,8,-8)$. *Dapatkan:*

i. $B \times C$ [3 marks]
[*3 markah*]

ii. $C \times A$ [3 marks]
[*3 markah*]

iii. $A \times B$ [3 marks]
[*3 markah*]

iv. $B \bullet A$. [3 marks]
[*3 markah*]

v. $C \bullet B$ [3 marks]
[*3 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

CLO1 C3 (a) Find the partial fractions for fractions below:
Dapatkan pecahan separa bagi pecahan dibawah:

i. $\frac{5}{(x-2)(x+3)}$ [5 marks]
[*5 markah*]

ii. $\frac{3x}{(1-x)(1+2x)}$ [5 marks]
[*5 markah*]

CLO2 C3 (b) Solve the following partial fractions decomposition:
Selesaikan pecahan separa bagi setiap yang berikut:

i. $\frac{2-6x-3x^2}{(1+x)(1-2x)^2}$ [7 mark]
[*7 markah*]

ii. $\frac{2x^2+1}{x^3+2x^2+x}$ [8 marks]
[*8 markah*]

QUESTION 5

SOALAN 5

CLO 1
C3

a) Based on the Diagram 5(a), find the following values :

Merujuk kepada Rajah 5(a), cari nilai yang berikut :

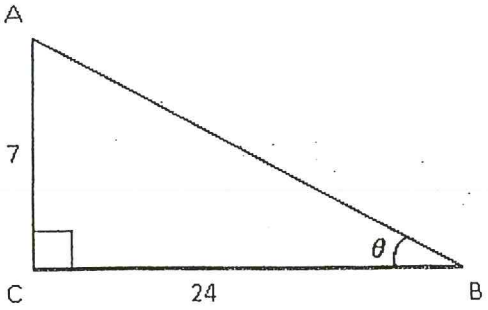


Diagram 5(a)

Rajah 5(a)

i. The length of AB.

Panjang AB.

[3 marks]
[*3 markah*]

ii. Sec θ.

Sek θ.

[3 marks]
[*3 markah*]

CLO 1
C3

b) Find the value of $\sin\theta = 0.9675$, where $0^\circ \leq \theta \leq 360^\circ$.

Cari nilai untuk $\sin\theta = 0.9675$, *dimana* $0^\circ \leq \theta \leq 360^\circ$.

[4 marks]
[*4 markah*]

CLO 2
C3

c) Solve the equation $3\ sec^2 x = 5\ (1 + \tan x)\ for\ 0^\circ \leq x \leq 360^\circ$.

Selesaikan persamaan $3\ sek^2 x = 5\ (1 + tan\, x)$ *untuk* $0^\circ \leq x \leq 360^\circ$.

[9 marks]
[*9 markah*]

CLO 2
C3

d) Referring to Diagram 5(d), calculate:
Merujuk kepada rajah 5(d), kirakan:

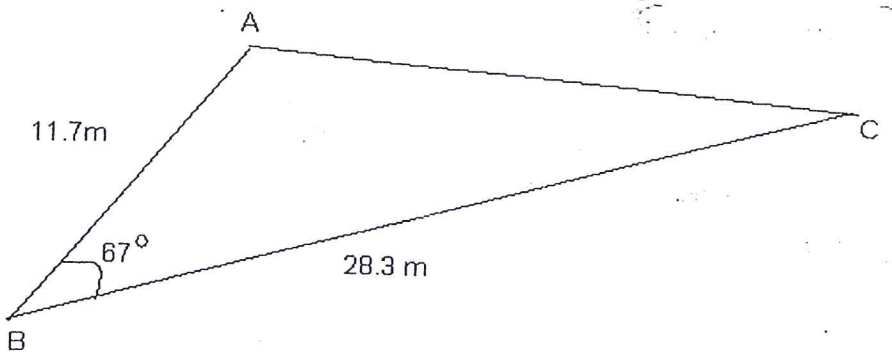


Diagram 5(d)

Rajah 5(d)

i. Area of triangle ABC.
Luas segitiga ABC.

[2 marks]
[*2 markah*]

ii. Length of AC.
Panjang AC.

[4 marks]
[*4 markah*]

QUESTION 6
SOALAN 6

a) Given $z = 2 + 3i$ and $w = 5 - 2i$, solve each of the following expression and write the answer in (a+bi) form.

CLO1
C2

Diberi $z = 2 + 3i$ *dan* $w = 5 - 2i$, *selesaikan setiap ungkapan yang berikut dan tulis jawapan dalam bentuk (a+bi).*

i) $z + w$ [2 marks]
[*2 markah*]

ii) w^2 [4 marks]
[*4 markah*]

iii) zw [4 marks]
[*4 markah*]

CLO2
C3

b) i. Calculate $\frac{(8+3i)}{(2<55°)}$. Hence, write the answer into polar form and exponential form.

[10 marks]

Kirakan $\frac{(8+3i)}{(2<55°)}$. *Seterusnya, tuliskan jawapan dalam bentuk polar dan eksponen.*

[*10 markah*]

ii. Using conjugate method, calculate:
Dengan menggunakan kaedah konjugat, kira:

$$\frac{4+2i}{1+3i}$$

[5 marks]
[5 markah]

SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

QUADRATIC EQUATION

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

FORMULA OF TRIANGLE

Sine Rules; $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rules; $a^2 = b^2 + c^2 - 2bc\cos A$

Area of Triangle $= \frac{1}{2}ab\sin C$

MATRIX

Co factor $C = (-1)^{(i+j)} M_{ij}$

$Adjoin, Adj(A) = C^T$

$Inverse\ of\ Matrix, A^{-1} = \frac{1}{|A|}Adj(A)$

COMPLEX NUMBER

$Modulus\ of\ z = \sqrt{a^2 + b^2}$

$Argument\ of\ z = tan^{-1}\left(\frac{b}{a}\right)$

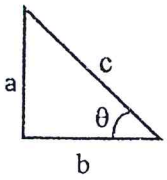
$Cartesian\ Form; z = a + bi$

$Polar\ Form; z = r\angle\theta$

$Exponential\ Form; z = re^{i\theta}$

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

$Unit\ Vector, \hat{u} = \frac{u}{|u|}$

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

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

$Area\ of\ parallellogram\ ABC = |\overrightarrow{AB} \times \overrightarrow{BC}|$

COMPOUND-ANGLE

$sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$

$cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$

$tan(A \pm B) = \frac{tan\ A \pm tan\ B}{1 \mp \tan A\tan B}$

DOUBLE-ANGLE

$\sin 2A = 2\sin A\cos A$

$\cos 2A = cos^2A - sin^2A$

$= 1 - 2sin^2A$

$= 2cos^2A - 1$

$\tan 2A = \frac{2\tan A}{1 - tan^2A}$