POLITEKNIK
MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

DBM1013 : ENGINEERING MATHEMATICS 1

TARIKH   : 04 APRIL 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 : 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

CLO1

C2

a)   Simplify each of the following into a single algebraic fraction.

Permudahkan setiap yang berikut ke dalam pecahan algebra tunggal.

i. $2pq - 4pr + pr - 2rq + 3qp$

[2 marks]

[*2 markah*]

ii. $\dfrac{3x+6}{x^2-4}$

[3 marks]

[*3 markah*]

iii. $\dfrac{2}{m}+\dfrac{5}{n}$

[2 marks]

[*2 markah*]

iv. $(6x+8y)\times\dfrac{y}{4x}$

[3 marks]

[*3 markah*]

CLO1

C3

b) Solve the following equations:

Selesaikan persamaan persamaan berikut:

    i. $4x - x^2 = 0$ (By using factorization method.)

        $4x - x^2 = 0$ *(Dengan menggunakan kaedah pemfaktoran.)*

[3 marks]

[*3 markah*]

    ii. $4x^2 + 3x - 2 = 0$ (By using quadratic formula.)

        $4x^2 + 3x - 2 = 0$ *(Dengan menggunakan kuadratik formula.)*

[6 marks]

[*6 markah*]

    iii. $2x^2 + 8x = 5$ (By using completing the square method.)

        $2x^2 + 8x = 5$ *((Dengan menggunakan kaedah penyempurnaan kuasa dua.)*

[6 marks]

[*6 markah*]

QUESTION 2
SOALAN 2

CLO2
C1

a) Given matrix A=$\begin{bmatrix} -2 & a \\ b+1 & 8 \\ 5 & 10 \end{bmatrix}$ and B=$\begin{bmatrix} -2 & 8 \\ 6 & 9 \\ 2c+3 & 10 \end{bmatrix}$. If A=B, find the values of a, b and c.

Diberi matrik A =$\begin{bmatrix} -2 & a \\ b+1 & 8 \\ 5 & 10 \end{bmatrix}$ dan B =$\begin{bmatrix} -2 & 8 \\ 6 & 9 \\ 2c+3 & 10 \end{bmatrix}$. Jika A = B, cari nilai-nilai a, b dan c.

[4 marks]

[*4 markah*]

CLO2
C2

b) The determinant of matrix A=$\begin{bmatrix} 1 & 0 & 3 \\ x & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}$ is 10.

Penentu bagi matrik A=$\begin{bmatrix} 1 & 0 & 3 \\ x & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}$ adalah 10.

    i.   Calculate the value of x

        Kirakan nilai x

[2 marks]

[*2 markah*]

    ii.   Convert matrix A into inverse matrix, A^{-1}

        Tukarkan matrik A kepada matrik songsang, A^{-1}

[8 marks]

[*8 markah*]

CLO2
C3

c) Solve the following equations by using Cramer's Rule:

Selesaikan persamaan berikut dengan menggunakan Petua Cramer:

$$-2x + 3y - z = 1$$
$$x + 2y - z = 4$$
$$-2x + 3z = 8$$

[11 marks]

[*11 markah*]

QUESTION 3
SOALAN 3

CLO2
C2

a) Given A and B are the points with coordinate (4,6) and (10,2).

Diberi, A dan B adalah koordinat dengan titik (4,6) dan (10,2).

i. Sketch vector $\overrightarrow{AB}$ by using a triangle method.

Lakarkan vektor $\overrightarrow{AB}$ menggunakan kaedah segitiga.

[2 marks]

[*2 markah*]

ii. Determine the value of $\overrightarrow{AB}$.

Tentukan nilai bagi $\overrightarrow{AB}$.

[4 marks]

[*4 markah*]

iii. Calculate the magnitude of vector $\overrightarrow{AB}$.

Kira magnitud bagi vektor $\overrightarrow{AB}$.

[2 marks]

[*2 markah*]

iv. Find the value of A – B.

Dapatkan nilai A – B.

[2 marks]

[*2 markah*]

CLO2
C3

b)   A, B and C is a triangle with (1,3,6), (3,-2,6) and (3,4,-7). Calculate :

A, B dan C merupakan segitiga dengan bucu-bucu (1,3,6), (3,-2,6) dan (3,4,-7). Kirakan :

    i. $\overrightarrow{AB}$

[2 marks]

[2 markah]

    ii. $\overrightarrow{BC}$

[2 marks]

[2 markah]

    iii. $\overrightarrow{AB} \times \overrightarrow{BC}$

[4 marks]

[4 markah]

    iv.   Area of triangle ABC

Luas segitiga ABC

[3 marks]

[3 markah]

    v.   Unit vector of $\overrightarrow{AB} \times \overrightarrow{BC}$

Vektor unit $\overrightarrow{AB} \times \overrightarrow{BC}$

[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

CLO1
C2

a)   Given $5x + 1 = A(x-1) + B(x+1)$, find the values of A and B

Diberi $5x + 1 = A(x-1) + B(x+1)$, cari nilai A dan B:

[4 marks]

[4 markah]

CLO1
C3

b)   Solve the following partial fractions:

Selesaikan pecahan separa berikut:

    i. $\dfrac{10x}{x^2 - 25}$

[6 marks]

[6 markah]

    ii. $\dfrac{3}{x(x-2)^2}$

[7 marks]

[7 markah]

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

[8 marks]

[8 markah]

QUESTION 5
SOALAN 5

CLO1
C2

a)   Given that $\sin\theta = \dfrac{5}{13}$ with $0° \le \theta \le 360°$. Without using a calculator, find the values for the following:

Diberi $\sin\theta = \dfrac{5}{13}$ dengan $0° \le \theta \le 360°$. Tanpa menggunakan kalkulator, cari nilai-nilai bagi:

     i. $\tan\theta$

[3 marks]
[3 markah]

     ii. $\operatorname{cosec}\theta$

[3 marks]
[3 markah]

     iii. $\cot\theta$

[3 marks]
[3 markah]

     iv. $\cos\theta$

[1 mark]
[1 markah]

CLO1
C3

(b)   Find the values for the following trigonometric function by showing the quadrants.

Dapatkan nilai bagi fungsi trigonometri dengan menunjukkan sukuan.

     i. $\cos\theta = 0.2542$ where $0° \le \theta \le 360°$

[7 marks]
[7 markah]

     ii. $\tan\theta = -5.1446$ where $0° \le \theta \le 360°$

[8 marks]
[8markah]

QUESTION 6
SOALAN 6

CLO1
C2

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

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

     i. $(-3 - 2i) + (-i + 2)$

[2 marks]
[2 markah]

     ii. $3[(2i-1)-(-1+5i)]$

[3 marks]
[3 markah]

     iii. $\dfrac{4-2i}{-2-6i}$

[5 marks]
[5 markah]

CLO2
C3

b)   Find the modulus and argument for the following complex number:

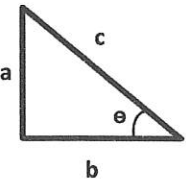*Carikan modulus dan hujah bagi nombor komplek berikut:*

     i. $5 - 10i$

[5 marks]
[5 markah]

     ii. $-4 - 7i$

[5 marks]
[5 markah]

     iii. $21 - 20i$

[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

$Sine\ Rules\ ; \dfrac{a}{sinA} = \dfrac{b}{sinB} = \dfrac{c}{sinC}$

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

$Area\ of\ Triangle = \dfrac{1}{2}ab\ sinC$

MATRIX

$Cofactor, C = (-1)(i+j)M_{ij}$

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

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

COMPLEX NUMBER

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

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

$Cartesian\ Form\ ;\ z = a + bi$

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

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

TRIGONOMETRY

Pythagoras' Theorem

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

Trigonometry Identities

$tan\theta = \dfrac{sin\theta}{cos\theta}$

$cos^2\theta + sin^2\theta = 1$

$1 + tan^2\theta = sec^2\theta$

$1 + cot^2\theta = cosec^2\theta$

VECTOR & SCALAR

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

$\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$

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

$Area\ of\ parallellogram\ ABC = \left|\overrightarrow{AB} \times \overrightarrow{bc}\right|$

COMPOUND-ANGLE

$sin(A \pm B) = sinAcosB \pm cosAsinB$

$cos(A \pm B) = cosAcosB \mp sinAsinB$

$tan(A \pm B) = \dfrac{tanA \pm tanB}{1 \mp tanAtanB}$

DOUBLE-ANGLE

$sin2A = 2sinAcosA$

$cos2A = cos^2A - sin^2A$
$\qquad\ = 1 - 2sin^2A$
$\qquad\ = 2cos^2A - 1$

$tan2A = \dfrac{2tanA}{1 - tan^2A}$