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 tunggai.

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 nilai 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*]

b) Solve the following partial fractions:

Selesaikan pecahan separa berikut:

CLO1
C3

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

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

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

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

MATRIX

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

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

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

COMPLEX NUMBER

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

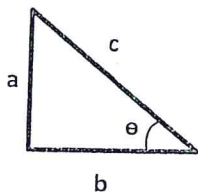$$Argument\ of\ z = tan^{-1}\left(\frac{b}{a}\right)$$

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

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

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

TRIGONOMETRY

Pythagoras' Theorem

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

Trigonometry 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

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

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

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

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

COMPOUND-ANGLE

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

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

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

DOUBLE-ANGLE

$$sin2A = 2sinAcosA$$

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

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