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)

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

CLO2
C2

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 2

CLO2
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 ,

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

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]
[2*markah*]

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

[2 marks]
[2*markah*]

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) $2\overrightarrow{OP} \bullet \overrightarrow{OQ}$

[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 OC = i – j -2k, OD = i – 3j – k and OE = 4i – 4j + 4k. Calculate:
Diberi vector OC = i – j -2k, OD = i – 3j – k dan OE = 4i – 4j + 4k. Kirakan:

2CD·3DE

[7 marks]
[*7 markah*]

(e) Given vectors $\overrightarrow{OM} = (2, -1, 3)$ and $\overrightarrow{ON} = (0, 1, 7)$. Find unit vector in the direction of $\overrightarrow{MN}$. :
Diberi vector $\overrightarrow{OM} = (2, -1, 3)$ *dan* $\overrightarrow{ON} = (0, 1, 7)$. *Dapatkan unit vector bagi arah* $\overrightarrow{MN}$. :

[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.

CLO1
C2

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

[4 marks]

[*4 markah*]

b) Solve the following partial fractions:

Selesaikan pecahan separa berikut:

CLO1
C3

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

[6 marks]

[*6 markah*]

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

[7 marks]

[*7 markah*]

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

[8 marks]

[*8 markah*]

QUESTION 5

SOALAN 5

CLO1
C2

a) Find all the angle for the trigonometric equation below for the range $0° \le x \le 360°$.

Cari semua sudut untuk persamaan trigonometri di bawah bagi julat $0° \le x \le 360°$.

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

[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

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

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

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

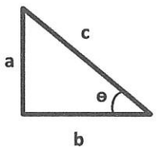
$$Cartesian\ Form\ ;\ z = a + bi$$

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

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

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

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

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

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

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

COMPOUND-ANGLE

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

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

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

DOUBLE-ANGLE

$$sin2A = 2sinAcosA$$

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

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