SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2014

DBM1013: ENGINEERING MATHEMATICS 1

TARIKH : 16 APRIL 2015
MASA : 8.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** 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
C3

a) Simplify the following expressions to the lowest term.
Permudahkan ungkapan berikut kepada sebutan terendah.

i. $\frac{4abc}{3x} \div \frac{6ab^2}{10xy}$ [2 marks]
[*2 markah*]

ii. $\frac{a-b}{c} \times \frac{c^2}{a^2-b^2}$ [3 marks]
[*3 markah*]

iii. $\left(\frac{6}{x+6} - \frac{5}{x+5}\right) \times \left(\frac{x+5}{x}\right)$ [5 marks]
[*5 markah*]

CLO2
C3

b) Solve the following quadratic equations:
Selesaikan persamaan kuadratik berikut:

i. $2x^2 - 5x = 1$ (Quadratic formula method.) [6 marks]
[*6 markah*]

ii. $x(3x + 10) = 77$ (Completing the square) [9 marks]
[*9 markah*]

QUESTION 2
SOALAN 2

CLO 1
C3

a) Given $A = \begin{bmatrix} 4 & 5 \\ 3 & -1 \\ 2 & 0 \end{bmatrix}, B = \begin{bmatrix} 2 & -5 & 1 \\ 4 & -1 & 3 \end{bmatrix}, C = \begin{bmatrix} 3 & 1 \\ 5 & -2 \\ 7 & 6 \end{bmatrix}$, find:

Diberi $A = \begin{bmatrix} 4 & 5 \\ 3 & -1 \\ 2 & 0 \end{bmatrix}, B = \begin{bmatrix} 2 & -5 & 1 \\ 4 & -1 & 3 \end{bmatrix}, C = \begin{bmatrix} 3 & 1 \\ 5 & -2 \\ 7 & 6 \end{bmatrix}$, *dapatkan:*

i. $A + B^T$ [2 marks]
[*2 markah*]

ii. $(A - C)^T$ [2 marks]
[*2 markah*]

CLO 2
C3

b) If $M = \begin{bmatrix} 2 & 5 & 6 \\ -1 & 0 & 4 \\ 7 & 3 & 1 \end{bmatrix}, N = \begin{bmatrix} 1 & 2 \\ 0 & 3 \\ 7 & 2 \end{bmatrix}$, compute:

Jika $M = \begin{bmatrix} 2 & 5 & 6 \\ -1 & 0 & 4 \\ 7 & 3 & 1 \end{bmatrix}, N = \begin{bmatrix} 1 & 2 \\ 0 & 3 \\ 7 & 2 \end{bmatrix}$, *kirakan:*

i. Determinant M [2 marks]
Penentu bagi M [*2 markah*]

ii. MN [4 marks]
[*4 markah*]

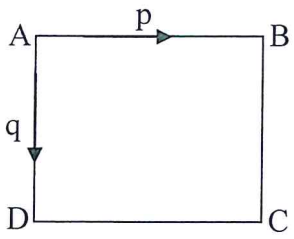
CLO 2
C3

c) Solve the simultaneous equation below by using inverse matrix method.
Selesaikan persamaan serentak di bawah dengan menggunakan kaedah songsangan matrik.

$$x - 2y + z = 3$$
$$2x + y - z = 5$$
$$3x - y + 2z = 12$$

[15 marks]
[*15 markah*]

QUESTION 3
SOALAN 3



CLO1 C2

a) Based on diagram above, $\overrightarrow{AB} = p$ and $\overrightarrow{AD} = q$. Express in terms of p and q:
Berdasarkan kepada rajah di atas, $\overrightarrow{AB} = p$ *dan* $\overrightarrow{AD} = q$. *Ungkapkan dalam sebutan* p dan q*:*

(i) $\overrightarrow{AC}$ [2 marks]
[*2 markah*]

(ii) $\overrightarrow{DB}$ [2 marks]
[*2Markah*]

CLO2 C3

b) Given, A and B are the point with coordinate (2,3) and (5,1) respectively.
Diberi, A dan B adalah koordinat dengan titik (2,3) *dan* (5,1) *masing-masing.*

(i) Sketch vector $\overrightarrow{AB}$ using triangle method. [2 marks]
Lakarkan vektor $\overrightarrow{AB}$ *menggunakan kaedah segitiga* [*2markah*]

(ii) Define the value of $\overrightarrow{AB}$ [2 marks]
Tentukan nilai bagi $\overrightarrow{AB}$ [*2markah*]

(iii) Calculate the magnitude of vector $\overrightarrow{AB}$ [2 marks]
Kira nilai bagi vektor $\overrightarrow{AB}$ [*2markah*]

CLO3
C3

c) A, B and C is a triangle with $(0,1,3)$, $(4,-1,2)$ and $(1,3,-5)$ respectively. Calculate:

A, B dan C merupakan sebuah segitiga dengan bucu-bucu $(0,1,3)$, $(4,-1,2)$ *dan* $(1,3,-5)$ *masing-masing. 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 [4 marks]
Luas segitiga ABC [*4 markah*]

v. Unit vector of $\overrightarrow{AB} \times \overrightarrow{BC}$ [3 marks]
Vektor unit $\overrightarrow{AB} \times \overrightarrow{BC}$ [*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) Express the following fractions into partial fraction.
Nyatakan pecahan-pecahan yang berikut kepada pecahan separa.

i. $\dfrac{3x}{(x-1)^2}$ [5 marks]
[5 markah]

ii. $\dfrac{8x-42}{x^2+3x-18}$ [5 marks]
[5 markah]

CLO2 C3

b) Solve the following partial fractions.
Selesaikan pecahan separa berikut.

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

ii. $\dfrac{3-5x+3x^2}{(1-2x)(1+x^2)}$ [9 marks]
[*9 markah*]

QUESTION 5
SOALAN 5

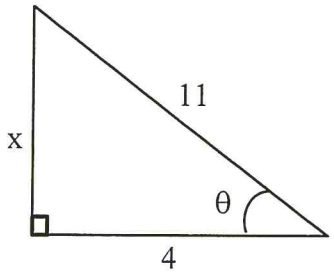


Diagram 5
Rajah 5

CLO1 C3

a) Based on the Diagram 5 above, find the values of :
Berdasarkan Rajah 5 di atas, cari nilai-nilai bagi:

i. $\tan\theta$ [4 marks]
[*4 markah*]

ii. $cosec\ \theta$ [3 marks]
[*3 markah*]

iii. $\cot\theta$ [3 marks]
[*3 markah*]

CLO2 C3

b) Solve the following trigonometric equations:
Selesaikan persamaan trigonometri berikut:

i. $3\sin 2x - 1 = 1, for\ 0° < x < 360°$ [5 marks]
[*5 markah*]

ii. $4\ cosec^2 x - 7 = 4\cot x\ , for\ 0° < x < 360°$ [10 marks]
[*10 markah*]

QUESTION 6
SOALAN 6

CLO1 C2

a) Given that $J = -2 + 3i$, $K = 5 - 9i$, $L = -2 - 4i$. Express each of the following in the form of $a + bi$

Diberi persamaan $J = -2 + 3i$, $K = 5 - 9i$, $L = -2 - 4i$. *Ungkapkan persamaan berikut dalam bentuk* $a + bi$

i. $J + L$ [2 marks]
[*2 markah*]

ii. $2(L - K)$ [3 marks]
[*3 markah*]

iii. $\frac{J}{L}$ [5 marks]
[*5 markah*]

CLO 2 C3

b) Given that $M = (-8 - 3i)$, $N = (-4 - 3i)$. Find the modulus, the argument and sketch the Argand's Diagram for:

Diberi $M = (-8 - 3i)$, $N = (-4 - 3i)$. *Dapatkan modulus, hujahan, dan lakarkan gambarajah Argand's bagi:*

i. M [7 marks]
[*7 markah*]

ii. MN [8 marks]
[*8 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; $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

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

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

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

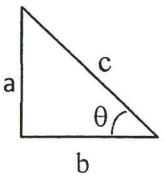
$Cartesian\ Form; z = a + bi$

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

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

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

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

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

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

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

VECTOR & SCALAR

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

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

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

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

COMPOUND-ANGLE

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

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

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

DOUBLE-ANGLE

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

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

$= 1 - 2sin^2 A$

$= 2cos^2 A - 1$

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