

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2018

DBM1013: ENGINEERING MATHEMATICS 1

TARIKH : 13 APRIL 2019

MASA : 11.15 PAGI - 1.15 PETANG (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Struktur (2 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)



SULIT

SECTION A : 50 MARKS**BAHAGIAN A : 50 MARKAH****INSTRUCTION:**

This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi TWO (2) soalan berstruktur. Jawab semua soalan.

QUESTION 1**SOALAN 1**

CLO1
C2

- a) State each of the following expression in the simplest form:
Nyatakan setiap ungkapan berikut ke dalam bentuk yang termudah:

i. $(m+n)^2 - n(2m-n)$

[2 marks]

[2 markah]

ii. $\frac{4x+2}{10x-2} - \frac{3-2x}{1-5x}$

[4 marks]

[4 markah]

iii. $\frac{t+2}{3t-9} \div \frac{t^2-4t+4}{t^2-6t+9}$

[4 marks]

[4 markah]



CLO1
C3

- b) Solve the following quadratic equations by using the given method:
Selesaikan persamaan kuadratik berikut dengan menggunakan kaedah yang dinyatakan:

i. $b^2 = 4b + 21$
(Factorization)
(Pemfaktoran)

[4 marks]

[4 markah]

ii. $3t^2 - 4t = 7$
(Quadratic Formula)
(Formula Kuadratik)

[5 marks]

[5 markah]

iii. $y^2 + 8y - 2 = 0$
(Completing the square)
(Penyempurnaan kuasa dua)

[6 marks]

[6 markah]



QUESTION 2

SOALAN 2

CLO1
C2

- a) Determine the value of A and B for the partial fraction decomposition below:
Tentukan nilai A dan B bagi penguraian pecahan separa berikut:

$$\frac{5x+13}{x^2+4x-5} = \frac{A}{(x-1)} + \frac{B}{(x+5)}$$

[4 marks]

[4 markah]

CLO1
C3

- b) Decompose the following fractions into partial fraction:
Uraikan pecahan berikut kepada pecahan separa:

i. $\frac{3x-5}{x^2-x-12}$

[5 marks]

[5 markah]

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

[6 marks]

[6 markah]

iii. $\frac{3x-5}{(x-1)(x^2+x+1)}$

[6 marks]

[6 markah]

iv. $\frac{3x^2-5}{x-2}$

[4 marks]

[4 markah]



SECTION B : 50 MARKS**BAHAGIAN B : 50 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab DUA (2) soalan sahaja

QUESTION 3**SOALAN 3**

CLO2
C2

- a) Given that the position vectors of point A, B and C with respect to the origin are:
 $\overrightarrow{OA} = 3i + 2j - 4k$, $\overrightarrow{OB} = 2i - j + 3k$ and $\overrightarrow{OC} = -i + 3j - 2k$. Compute

Diberi kedudukan vektor A, B and C adalah :

$\overrightarrow{OA} = 3i + 2j - 4k$, $\overrightarrow{OB} = 2i - j + 3k$ and $\overrightarrow{OC} = -i + 3j - 2k$. Kira

i) \overrightarrow{AB}

[3 marks]

[3 markah]

ii) \overrightarrow{BC}

[3 marks]

[3 markah]

iii) $\overrightarrow{AB} \bullet \overrightarrow{BC}$

[4 marks]

[4 markah]



CLO2
C3

- b) Given vectors $A = 6i - 14j + 4k$ and $B = 20i + 8j - 2k$. Calculate
Diberi vektor $A = 6i - 14j + 4k$ dan $B = 20i + 8j - 2k$. Kira

i. $A - B$

[3 marks]

[3 markah]

ii. $A \times B$

[3 marks]

[3 markah]

iii. \overrightarrow{AB}

[5 marks]

[5 markah]

- iv. Prove that the vector A is perpendicular to vector B .

Buktikan vektor A serenjang kepada vektor B .

[4 marks]

[4 markah]



QUESTION 4

SOALAN 4

CLO2
C2

- a) i) Represent 250° using a circular diagram and state the quadrant where the angle lies in.

Tunjukkan 250° dengan menggunakan diagram dan nyatakan sukuan di mana sudut itu berada.

[2 marks]

[2 markah]

- ii) Given $\sin A = \frac{3}{5}$, $90^\circ < A < 180^\circ$ and $\sin B = \frac{12}{13}$, $180^\circ < B < 270^\circ$

Without using a calculator, determine the value of :

Diberi $\sin A = \frac{3}{5}$, $90^\circ < A < 180^\circ$ and $\sin B = \frac{12}{13}$, $180^\circ < B < 270^\circ$

Tanpa menggunakan kalkulator, tentukan nilai berikut :

a. $\sin(A + B)$

[5 marks]

[5 markah]

b. $\cos(A - B)$

[3 marks]

[3 markah]

CLO2
C3

- b) i) Find all the angles between 0° and 360° that satisfy the following.

Dapatkan semua sudut di antara 0° and 360° yang memenuhi persamaan di bawah :

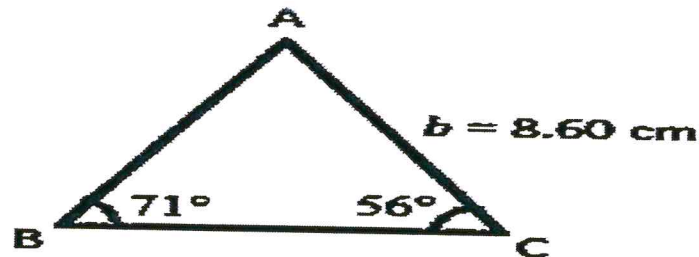
$$2\cos^2 x + \cos x = 0$$

[8 marks]

[8 markah]



ii)



Refer to diagram 4b(ii)

Merujuk kepada rajah 4b(ii):

- a. Find the length of a and c and angle of BAC .
Tentukan panjang 'a' dan 'c' dan sudut BAC .

[5 marks]

[5 markah]

- b. Calculate the area of triangle.
Kirakan luas segitiga

[2 marks]

[2 markah]



QUESTION 5

SOALAN 5

CLO2
C2a) i) Given $u = 3 + 4i$, $v = 1 - 3i$, $w = -2 + 5i$. Find:*Diberi $u = 3 + 4i$, $v = 1 - 3i$, $w = -2 + 5i$. Cari:*

a. $2u - v$

[3 marks]

[3 markah]

b. \overline{uw}

[4 marks]

[4 markah]

ii) State the following complex number in the form of polar and exponent.

Nyatakan nombor kompleks berikut dalam bentuk polar dan eksponen.

$$z = 32(\cos 265^\circ + i \sin 265^\circ)$$

[3 marks]

[3 markah]

CLO2
C3b) i) Given $z_1 = 5 - 3i$ and $z_2 = 3 + 5i$, find:*Diberi $z_1 = 5 - 3i$ and $z_2 = 3 + 5i$, cari:*

a. $z_1 z_2$

[3 marks]

[3 markah]

b. $\frac{z_1^2}{z_2}$

[5 marks]

[5 markah]



- ii) Represent the following complex number on an Argand Diagram and find its modulus and argument.

Tunjukkan nombor kompleks yang berikut dalam bentuk Argand Diagram dan kirakan modulus dan hujah.

$$z = 6 - 4i$$

[7 marks]

[7 markah]

QUESTION 6

SOALAN 6

CLO2
C2

- a) i) Find the value of a and b for the following matrices.

Cari nilai a dan b untuk matrik-matrik yang berikut.

$$\begin{bmatrix} \frac{3}{4}a & -4 \\ -2 & 1 \end{bmatrix} + \begin{bmatrix} \frac{1}{2}a & -1 \\ -3b & 0 \end{bmatrix} = \begin{bmatrix} 5 & -5 \\ 7 & 1 \end{bmatrix}.$$

[6 marks]

[6 markah]

- ii) Given that, $P = \begin{bmatrix} 1 & 2 \\ 3 & -4 \\ 4 & 3 \end{bmatrix}$ and $Q = \begin{bmatrix} 2 & -4 & 6 \\ 3 & 2 & 1 \end{bmatrix}$. Find PQ .

$$\text{Diberi, } P = \begin{bmatrix} 1 & 2 \\ 3 & -4 \\ 4 & 3 \end{bmatrix} \text{ dan } Q = \begin{bmatrix} 2 & -4 & 6 \\ 3 & 2 & 1 \end{bmatrix}. \text{ Cari } PQ.$$

[4 marks]

[4 markah]



CLO2
C3

b) i) Given that, $C = \begin{bmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{bmatrix}$ and $D = \begin{bmatrix} 0 & -1 & 1 \\ 2 & 0 & 3 \end{bmatrix}$. Determine:

Diberi, $C = \begin{bmatrix} -2 & 3 \\ 4 & -3 \\ 0 & 1 \end{bmatrix}$ dan $D = \begin{bmatrix} 0 & -1 & 1 \\ 2 & 0 & 3 \end{bmatrix}$. Tentukan :

a. $C + D^T$

[3 marks]

[3 markah]

b. $D - C^T$

[3 marks]

[3 markah]

ii) Based on matrix $R = \begin{bmatrix} 5 & -1 & -2 \\ 2 & -2 & 2 \\ -3 & -4 & -6 \end{bmatrix}$. Find :

Berdasarkan matrik $R = \begin{bmatrix} 5 & -1 & -2 \\ 2 & -2 & 2 \\ -3 & -4 & -6 \end{bmatrix}$. Cari

a. Determinant of matrix R
Penentu matrik R

[2 marks]

[2 markah]

b. Minor of matrix R
Minor matrik R

[3 marks]

[3 markah]

c. Inverse of matrix R
Songsangan bagi matrik R

[4 marks]

[4 markah]



SOALAN TAMAT

FORMULA SHEET FOR ENGINEERING MATHEMATICS (DBM1013)

QUADRATIC EQUATION

1. **Quadratic formula**, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
2. **Completing the square**,

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

FORMULA OF TRIANGLE

1. **Sine Rules**; $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
2. **Cosine Rules**; $a^2 = b^2 + c^2 - 2bc \cos A$
3. **Area of Triangle** $= \frac{1}{2}ab \sin C$

MATRIX

1. **Cofactor**; $C = (-1)^{i+j} M_{ij}$
2. **Adjoin**; $\text{Adj}(A) = C^T$
3. **Inverse of Matrix**; $A^{-1} = \frac{1}{|A|} \text{Adj}(A)$
4. **Cramer's Rule**;

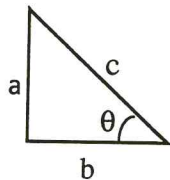
$$x = \frac{|A_1|}{|A|}, y = \frac{|A_2|}{|A|}, z = \frac{|A_3|}{|A|}$$

COMPLEX NUMBER

1. **Modulus of z** $= \sqrt{a^2 + b^2}$
2. **Argument of z** $= \tan^{-1}\left(\frac{b}{a}\right)$
3. **Cartesian Form**; $z = a + bi$
4. **Polar Form**; $z = r \angle \theta$
5. **Exponential Form**; $z = re^{i\theta}$
6. **Trigonometric Form**; $z = r(\cos \theta + i \sin \theta)$

TRIGONOMETRY

Pythagoras' Theorem



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

Trigonometric Identities

$$\begin{aligned} \tan \theta &= \frac{\sin \theta}{\cos \theta} \\ \cos^2 \theta + \sin^2 \theta &= 1 \\ 1 + \tan^2 \theta &= \sec^2 \theta \\ 1 + \cot^2 \theta &= \text{cosec}^2 \theta \end{aligned}$$

VECTOR & SCALAR

1. **Unit Vector**; $\hat{u} = \frac{\vec{u}}{|u|}$
2. **Cos θ** $= \frac{\vec{A} \cdot \vec{B}}{|\vec{A}| |\vec{B}|}$
3. **Scalar Product**;

$$\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$$
4. **Vector Product**;

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$
5. **Area of parallelogram ABC**;

$$|\vec{AB} \times \vec{BC}|$$

COMPOUND-ANGLE

1. $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
2. $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
3. $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

DOUBLE-ANGLE

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

$$= 1 - 2\sin^2 A$$

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

