KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2023/2024

DBM10063: MATHEMATICAL COMPUTING

TARIKH : 25 MEI 2024
MASA : 11.30 PAGI – 1.30 PETANG (2 JAM)

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answers **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1   (a)   Change the following numbering systems into **decimal** and **binary** number system.

*Tukarkan sistem nombor berikut kepada nombor sistem **asas sepuluh** dan **asas dua**.*

i. 76132_8

[5 marks]

[*5 markah*]

ii. $A8D9_{16}$

[5 marks]

[*5 markah*]

CLO1   (b)   Solve the following binary arithmetic operations.

Selesaikan operasi aritmetik asas dua berikut.

i. $(111000 + 101111) - 1011$

[4 marks]

[*4 markah*]

ii. $1011000 + (1000111 - 11101)$

[4 marks]

[*4 markah*]

iii. 110011×110001

[7 marks]

[*7 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Express the algebraic expressions in the simplest form.

Ungkapkan ungkapan algebra berikut dalam bentuk yang paling ringkas.

i. $2(5a + 4b) - (9b - a)$ [4 marks]

[4 *markah*]

ii. $\dfrac{6}{m-3} + \dfrac{12+4m}{m^2-9}$ [5 marks]

[5 *markah*]

iii. $\dfrac{2a + 2b}{c^2} \div \dfrac{a^2 - b^2}{c^4}$ [6 marks]

[6 *markah*]

CLO1 (b) Solve the following quadratic equations by using the given method.

Selesaikan persamaan kuadratik berikut dengan menggunakan kaedah yang dinyatakan.

i. $3x^2 - 11x = 4$ (Factorization Method)

$3x^2 - 11x = 4$ *(Kaedah Pemfaktoran)*

[4 marks]

[4 *markah*]

ii. $2x^2 + 4 = 7x$ (Quadratic Formula)

$2x^2 + 4 = 7x$ *(Formula Kuadratik)*

[6 marks]

[6 *markah*]

QUESTION 3

SOALAN 3

CLO2   (a)   i.   Solve the following expression below in the form of $a + bi$.

Selesaikan ungkapan di bawah dalam bentuk a + bi.

$$\frac{5 + i}{2 - 3i}$$

[4 marks]

[4 markah]

ii.   Determine the value of a and b for: $(a + 2i) + (1 + bi) = -4 + i$.

Tentukan nilai a dan b bagi : $(a + 2i) + (1 + bi) = -4 + i$.

[5 marks]

[5 markah]

iii.   Calculate the modulus and argument for $2 - 4i$. Then, sketch the Argand's Diagram.

Kira modulus dan argument bagi $2 - 4i$. Seterusnya, lakarkan Rajah Argand.

[6 marks]

[6 markah]

CLO2 | (b)   Given $Z_1 = 3\angle 20°$, $Z_2 = 4e^{2.1i}$ and $Z_3 = 2(cos30° + isin30°)$.

Diberi $Z_1 = 3\angle 20°$, $Z_2 = 4e^{2.1i}$ dan $Z_3 = 2(cos30° + isin30°)$.

i.   Write Z_1 in the form of $a + bi$.

Tulis Z_1 dalam bentuk $a + bi$.

[2 marks]

[*2 markah*]

ii.   Write Z_2 in Trigonometry form.

Tulis Z_2 dalam bentuk Trigonometri.

[3 marks]

[*3 markah*]

iii.   Determine $\dfrac{Z_1 . Z_2}{Z_3}$ and state the answer in Polar form.

Tentukan $\dfrac{Z_1 . Z_2}{Z_3}$ dan nyatakan jawapan dalam bentuk Kutub.

[5 marks]

[*5 markah*]

QUESTION 4

SOALAN 4

CLO2   (a)   Given $A = \begin{bmatrix} 5 & 1 & 4 \\ -6 & 9 & 5 \\ 4 & -3 & -2 \end{bmatrix}$. Identify:

Diberi $A = \begin{bmatrix} 5 & 1 & 4 \\ -6 & 9 & 5 \\ 4 & -3 & -2 \end{bmatrix}$. *Kenal pasti*:

i.   Element a_{13} and a_{32}

Elemen a_{13} *dan* a_{32}

[2 marks]

[*2 markah*]

ii.   Size of matrix A

Saiz matrik A

[1 mark]

[*1 markah*]

iii. A^T

[1 mark]

[*1 markah*]

CLO2   (b)   Given $A = \begin{bmatrix} 1 & 4 & -2 \\ 2 & -3 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 & -1 \\ -6 & -5 & 1 \end{bmatrix}$ $C = \begin{bmatrix} -1 & 7 \\ 2 & 5 \\ 3 & 1 \end{bmatrix}$.

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

Calculate:

Hitung:

i. $A + 2B$.

[3 marks]

[*3 markah*]

ii. $(B - A)^T$.

[3 marks]

[*3 markah*]

iii. $2(B \times C)$.

[5 marks]

[*5 markah*]

CLO2   (c)   Solve simultaneous equation using Cramer's Rule.

Selesaikan persamaan serentak menggunakan Petua Cramer.

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & -1 & 1 \\ 1 & -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 5 \end{bmatrix}$$

[10 marks]

[*10 markah*]

SOALAN TAMAT

FORMULA SHEET FOR DBM10063: MATHEMATICAL COMPUTING

BASIC ALGEBRA

1. Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

MATRICES AND LINEAR ALGEBRA

1. Inverse Matrix: $A^{-1} = \frac{1}{|A|} adjA$

2. Cramer's Rule:

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

COMPLEX NUMBER

1. Modulus: $|z| = \sqrt{a^2 + b^2}$
2. Argument: $\arg z = \tan^{-1}\left(\frac{b}{a}\right)$

Complex number in other forms

1. Cartesian form: $z = a + bi$
2. Polar form: $z = |z|\angle\theta$
3. Exponential form: $z = |z|e^{i\theta}$
4. Trigonometric form: $|z|(\cos\theta + i\sin\theta)$

Multiplication & Division

1. $(a \angle \theta_a).(b \angle \theta_b) = (a)(b) \angle (\theta_a + \theta_b)$
2. $\frac{(a \angle \theta_a)}{(b \angle \theta_b)} = \left(\frac{a}{b}\right) \angle (\theta_a - \theta_b)$

DIFFERENTIATION

1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	2.	$\frac{d}{dx}(ax^n) = anx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	4.	$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$ [Product Rule]
5.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ [Quotient Rule]	6.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [Chain Rule]

Tangent and Normal Equation

$$y - y_1 = m(x - x_1)$$

INTEGRATION

1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c; \{n \neq -1\}$	2.	$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{(a)(n+1)} + c; \{n \neq -1\}$
3.	$\int k\, dx = kx + c, k \text{ is constant}$	4.	$\int_a^b f(x)dx = F(b) - F(a)$