SULIT

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 DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2024/2025

DBM10063: MATHEMATICAL COMPUTING

TARIKH : 06 DISEMBER 2024
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** 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. Answer **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 octal number.

Tukarkan sistem nombor berikut kepada nombor asas lapan.

i. 10111010_2

[5 marks]

[5 *markah*]

ii. $FC4_{16}$

[5 marks]

[5 *markah*]

CLO1 (b) Solve the following arithmetic operations:

Selesaikan operasi aritmetik berikut:

i. $(1011101_2 + 1100001_2) - (1100001_2 + 110101_2)$

[5 marks]

[*5 markah*]

ii. $(10100100_2 - 1011101_2) \times 11_2$

[5 marks]

[*5 markah*]

iii. $(11010_2 \times 110_2) + 1101011_2$

[5 marks]

[*5 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Simplify the following algebraic expressions:

Ringkaskan ungkapan algebra berikut:

i. $\frac{4}{x+5} + \frac{24}{x^2+4x-5}$

[5 marks]

[*5 markah*]

ii. $\frac{2x}{x^2-4} - \frac{1}{x-2}$

[5 marks]

[*5 markah*]

iii. $\frac{x-3}{x^2+3x-4} - \frac{2}{x+4}$

[5 marks]

[*5 markah*]

CLO1 (b) Solve the following quadratic equations by using the method given:
Selesaikan persamaan kuadratik berikut dengan menggunakan kaedah yang dinyatakan:

i. $x^2 - 2x - 10 = 3x + 4$ (Factorization method)
(*Kaedah Pemfaktoran*)

[4 marks]
[*4 markah*]

ii. $\frac{4x^2+x-3}{x} = 2$ (Quadratic formula)
(*Rumus Kuadratik*)

[6 marks]
[*6 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) Solve each of the following complex numbers in the form of $a+bi$.

Selesai setiap nombor kompleks berikut dalam bentuk $a+bi$.

i. $(3+i)(2-5i)$

[4 marks]

[*4 markah*]

ii. $\dfrac{2+7i}{3-5i}$

[5 marks]

[*5 markah*]

iii. $-i\,(3+4i)(2-3i)$

[6 marks]

[*6 markah*]

CLO2 (b) Given $Z_1 = 5 - i$ and $Z_2 = 6\,(cos\,30° + i\,sin\,30°)$.
Diberi $Z_1 = 5 - i$ dan $Z_2 = 6\,(cos\,30° + i\,sin\,30°)$.

i. Change Z_2 to Exponential form.
Tukarkan Z_2 *kepada bentuk Exponen.*

[2 marks]
[*2 markah*]

ii. Change Z_1 to Polar and Trigonometric Form.
Tukarkan Z_1 *kepada bentuk Polar dan Trigonometri.*

[5 marks]
[*5 markah*]

iii. Calculate $Z_1 Z_2$ and write the answer in Polar Form.
Kirakan $Z_1 Z_2$ *dan tuliskan jawapan dalam bentuk Polar.*

[3 marks]
[*3 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Given matrix $A = \begin{bmatrix} -2 & a \\ -1 & 4 \\ b & 3 \end{bmatrix}$, identify the element of:

Diberi matrik $A = \begin{bmatrix} -2 & a \\ -1 & 4 \\ b & 3 \end{bmatrix}$, *tentukan unsur bagi*:

i. A_{12} if $A_{12} = A_{11} + A_{22}$

[2 marks]

[*2 markah*]

ii. A_{31} if $A_{31} = A_{22} \times A_{32}$

[2 marks]

[*2 markah*]

CLO2 (b) Given matrix $A = \begin{bmatrix} 3 & 1 \\ -4 & 0 \\ 2 & 5 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 4 \\ 1 & 3 \\ 5 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 5 & 0 \\ -3 & 1 \\ 4 & 7 \end{bmatrix}$, calculate:

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

i. $A + B$

[2 marks]

[*2 markah*]

ii. $2(B - C)$

[3 marks]

[*3 markah*]

iii. $(2B)^T - (2C)^T$

[6 marks]

[*6 markah*]

CLO2 (c) Solve the following matrix equations by using Cramer's Rule.

Selesaikan persamaan matrik berikut dengan menggunakan kaedah Petua Cramer.

$$\begin{bmatrix} 2 & -2 & 1 \\ 3 & 1 & -1 \\ 1 & -3 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \\ 0 \end{bmatrix}$$

[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.	$\int_a^b f(x)dx = F(b) - F(a)$