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 : 2023/2024

DBM10063: MATHEMATICAL COMPUTING

TARIKH : 27 DISEMBER 2023
MASA : 2.30 PM – 4.30 PM (2 JAM)

Kertas ini mengandungi **ENAM (6)** 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 an octal and hexadecimal number system.

Tukarkan sistem nombor berikut kepada sistem nombor asas lapan dan asas enam belas.

i. 101001110_2

[4 marks]

[*4 markah*]

i. 3045_{10}

[6 marks]

[*6 markah*]

CLO1 (b) Solve the following arithmetic operations.

Selesaikan operasi aritmetik berikut.

i. $(11001001_2 + 110101_2) - (11001101_2 + 11011_2)$

[5 marks]

[*5 markah*]

ii. $(110010_2 - 100110_2) \times 111_2$

[5 marks]

[*5 markah*]

iii. $(101010_2 \times 101_2) + 1101011_2$

[5 marks]

[*5 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) Express the following algebraic expressions in the simplest form:

Nyatakan ungkapan algebra berikut dalam bentuk paling ringkas:

i) $\frac{(4x+2)}{2x} + \frac{(3-4y)}{3y}$

[5 marks]

[*5 markah*]

ii) $\frac{x^2+4x+3}{8} \times \frac{4}{x+3} - \frac{5x-2-(x+7)}{2}$

[5 marks]

[*5 markah*]

iii) $\frac{x^2+x-2}{6y-12} \times \frac{y^2-4}{3(x+2)}$

[5 marks]

[*5 markah*]

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

Selesaikan persamaan kuadratik berikut dengan menggunakan kaedah yang dinyatakan.

i) $6x^2 + 4x - 3 = 2x + 5x^2$ (Factorization Method)

(Kaedah Pemfaktoran)

[4 marks]

[*4 markah*]

ii) $3x(5 - 2x) = 5 + 3x - 3x^2$ (Quadratic Formula)

(Formula Kuadratik)

[6 marks]

[*6 markah*]

QUESTION 3

SOALAN 3

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

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

i. $(5+i)(6-5i)$

[4 marks]

[*4 markah*]

ii. $\frac{3+2i}{4-5i}$

[5 marks]

[*5 markah*]

iii. $-i\,(5+3i)(2-i)$

[6 marks]

[*6 markah*]

CLO2 (b) Given $w = 3-i$ and $z = -1-i$.

Diberi $w = 3-i$ *dan* $z = -1-i$.

i. Compute $w \times z$ in the form of $a+bi$

Kira $w \times z$ *dalam bentuk* $a+bi$

[3 marks]

[*3 markah*]

ii. Calculate the modulus and argument for $w \times z$.

Hitung modulus dan argumen bagi $w \times z$.

[4 marks]

[*4 markah*]

iii. Compute $w \times z$ in exponential form and trigonometric form.

Kira $w \times z$ *dalam bentuk eksponen dan trigonometri.*

[3 marks]

[*3 markah*]

QUESTION 4

SOALAN 4

CLO2 (a) Given matrix $A = \begin{bmatrix} 2 & 4 \\ x & -1 \\ -4 & y \end{bmatrix}$, show the elements of :

Diberi matrik $A = \begin{bmatrix} 2 & 4 \\ x & -1 \\ -4 & y \end{bmatrix}$, *tunjukkan unsur-unsur*:

i. A_{21} if $A_{21} = A_{11} + A_{31}$

[2 marks]

[*2 markah*]

ii. A_{32} if $A_{32} = A_{12} \times A_{22}$

[2 marks]

[*2 markah*]

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

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

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.

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

[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.	$\frac{d}{dx}\big(f(x) \pm g(x)\big) = f'(x) \pm g'(x)$	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.	$\int_a^b f(x)dx = F(b) - F(a)$