



**KOLEJ YAYASAN PELAJARAN JOHOR
FINAL EXAMINATION**

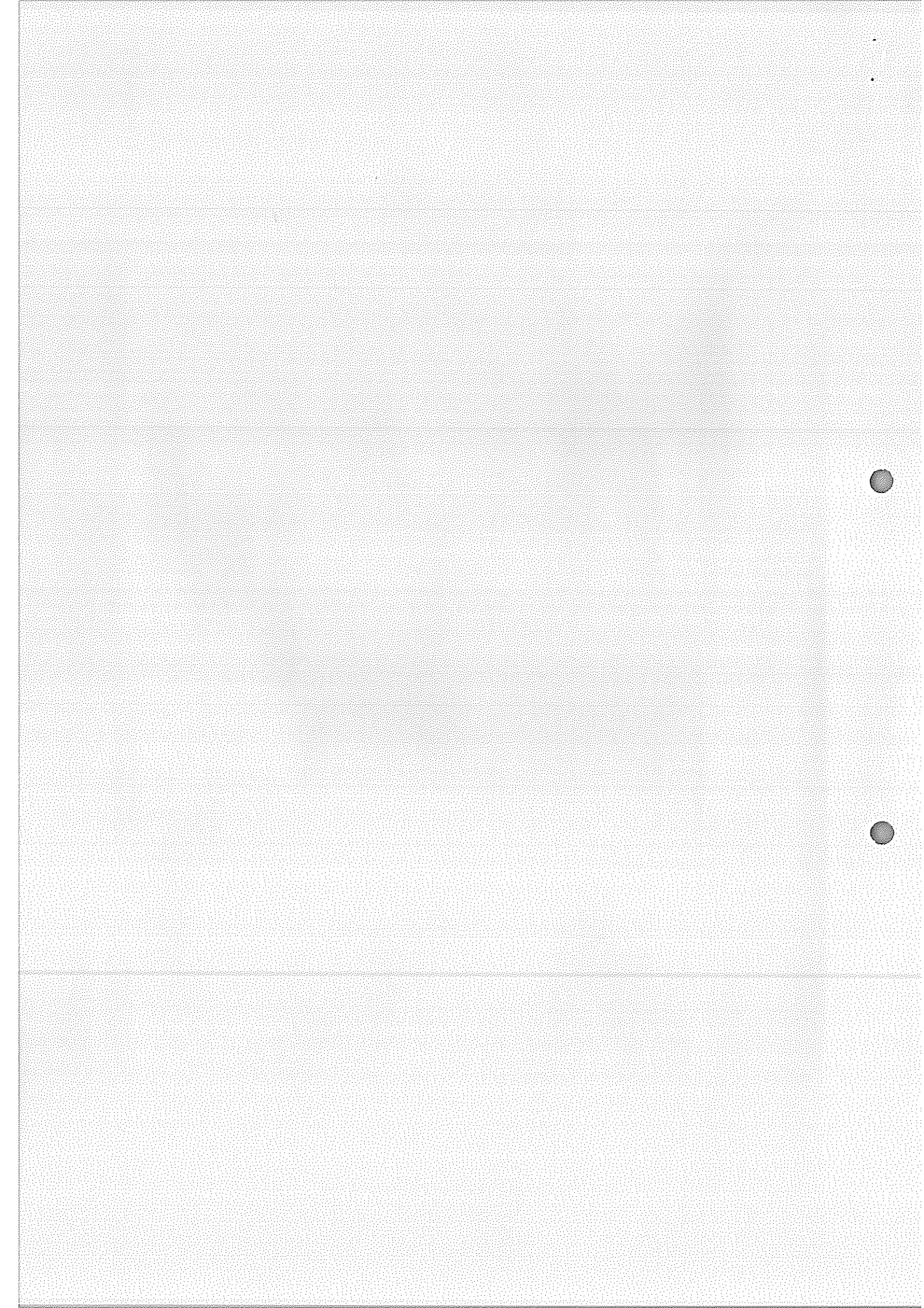
COURSE NAME : ENGINEERING MATHEMATICS 2
COURSE CODE : MAT 1022
SESSION : JUNE 2023
DURATION : 2 HOURS

**INSTRUCTION TO CANDIDATES /
ARAHAN KEPADA CALON**

1. This examination paper consists of **ONE (1)** part : / PART A (60 Marks) /
*Kertas soalan ini mengandungi **SATU (1)** bahagian:* BAHAGIAN A (60 Markah)
2. Candidates are not allowed to bring any material to the examination room except with the permission from the invigilator. The formula was attached at the back question paper. /
Calon tidak dibenarkan untuk membawa sebarang bahan/nota ke bilik peperiksaan tanpa arahan/kebenaran daripada pengawas. Rumus dilampirkan di belakang kertas soalan peperiksaan.
3. Please check to make sure that this examination pack consists of: /
Pastikan kertas soalan peperiksaan ini mengandungi:
 - i. Question Paper /
Kertas Soalan
 - ii. Answering Booklet /
Buku Jawapan

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO /
JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU**

This examination paper consists of **6** printed pages including front page
*Kertas soalan ini mengandungi **6** muka surat termasuk kulit hadapan*



PART A/ BAHAGIAN A

This part contains **SIX (6)** questions. Answer **ALL** questions in the answering booklet.

Bahagian ini mempunyai ENAM (6) soalan. Jawab SEMUA soalan di dalam kertas jawapan.

QUESTION 1/ SOALAN 1

- a) The fourth term of an arithmetic series is 13 and the common difference is 3. Find the first term and the sum of the first ten term.

Sebutan keempat bagi suatu siri aritmetik ialah 13 dan beza sepunya ialah 3.

Dapatkan sebutan pertama dan hasil tambah sepuluh sebutan pertama.

(3 marks / markah)

- b) Express the series $3 - 1 + \frac{1}{3} - \dots - \frac{1}{729}$ in the form $\sum_{r=1}^n U_r$.

Nyatakan siri $3 - 1 + \frac{1}{3} - \dots - \frac{1}{729}$ dalam bentuk $\sum_{r=1}^n U_r$

(3 marks / markah)

- c) Find $\sum_{r=1}^n r(3r^2 + 1)$ and hence evaluate $\sum_{r=21}^{40} r(3r^2 + 1)$.

Dapatkan $\sum_{r=1}^n r(3r^2 + 1)$ dan seterusnya nilaikan $\sum_{r=21}^{40} r(3r^2 + 1)$.

(3 marks / markah)

QUESTION 2/ SOALAN 2

- a) Find the term that does not contain x in the expansion of;

Dapatkan sebutan yang tidak mengandungi x dalam kembangan;

$$\left(x + \frac{2}{x}\right)^6$$

(3 marks / markah)

- b) i) Expand the binomial function $(1 + 3x)^{\frac{1}{3}}$ in an ascending power of x up to the term in x^3 .

Kembangkan fungsi binomial $(1 + 3x)^{\frac{1}{3}}$ dengan kuasa x menaik sehingga sebutan dalam x^3 .

(2 marks / markah)

- ii) By letting $x = \frac{1}{125}$ in above series, evaluate $\sqrt[3]{2}$ correct to five decimal places without using the calculator.

Dengan mengambil $x = \frac{1}{125}$ dalam siri di atas, nilaikan $\sqrt[3]{2}$ betul kepada lima tempat perpuluhan tanpa menggunakan kalkulator.

(5 marks / markah)

QUESTION 3/ SOALAN 3

Given;

Diberi;

$$A = \begin{pmatrix} 1 & -2 \\ -3 & 4 \\ 5 & 6 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 4 & 8 \\ -2 & 6 & -1 \end{pmatrix}, \quad C = \begin{pmatrix} -2 & 2 & -1 \\ 4 & 0 & 2 \\ 3 & -2 & 1 \end{pmatrix}$$

- a) Find the matrix;

Dapatkan matriks;

i. $\frac{1}{2}(A + B^T)$

(3 marks / markah)

ii. BA

(2 marks / markah)

- b) Find the inverse of matrix C by using adjoint method.

Dapatkan songsangan bagi matriks C dengan menggunakan kaedah adjoin.

(5 marks / markah)

QUESTION 4/ SOALAN 4

- a) By using the Crammer's Rule method, find the value of y and z .

Dengan menggunakan kaedah Petua Crammer's, dapatkan nilai y dan z .

$$2x + 4y - z = 52$$

$$-x + 5y + 3z = 72$$

$$3x - 7y + 2z = 10$$

(5 marks / markah)

- b) Solve the system of linear equations below by using the Gauss elimination method;

Selesaikan sistem persamaan linear berikut dengan menggunakan kaedah penghapusan Gauss;

$$x + 2y + 3z = 6$$

$$2x - 3y + 2z = 14$$

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

(6 marks / markah)

QUESTION 5/ SOALAN 5

Given three vectors $\underline{a} = 8i - 4j + 2k$, $\underline{b} = -5i + j + k$ and $\underline{c} = i + 7j - k$.

Diberi tiga vektor $\underline{a} = 8i - 4j + 2k$, $\underline{b} = -5i + j + k$ dan $\underline{c} = i + 7j - k$.

- a) Find the vector $\underline{a} + 2\underline{b}$.

Dapatkan vektor $\underline{a} + 2\underline{b}$.

(2 marks / markah)

- b) Find the angle between the vectors \underline{a} and \underline{c} .

Dapatkan sudut di antara vektor \underline{a} dan \underline{c} .

(4 marks / markah)

- c) Find the area of parallelogram with sides the vectors \underline{b} and \underline{c} .

Dapatkan luas parallelogram yang bersisikan vektor \underline{b} dan \underline{c} .

(3 marks / markah)

QUESTION 6/ SOALAN 6

- a) Simplify;

Ringkaskan;

i. $5i^2 + 2(5 - 10i) - 16$

(2 marks / markah)

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

(2 marks / markah)

- b) Solve the following equation for real x and y .

Selesaikan persamaan berikut untuk nilai nyata x dan y .

$$x + 2yi = (4 + 2i) + (2 - xi)$$

(3 marks / markah)

- c) Find the polar representation of $z = -1 - \sqrt{3}i$. Hence, find z^5 in polar form.

Dapatkan perwakilan kutub bagi $z = -1 - \sqrt{3}i$. Seterusnya, dapatkan z^5 dalam bentuk kutub.

(4 marks / markah)

[60 MARKS / MARKAH]

END OF QUESTION PAPER/ KERTAS SOALAN TAMAT

LIST OF FORMULA

SENARAI RUMUS

Arithmetic Progression

$$a_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

Geometric Progression

$$a_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r}, r < 1 \text{ or } S_n = \frac{a(r^n - 1)}{r-1}, r > 1$$

Theorems of Finite Series

$$1. \sum_{r=1}^n 1 = n$$

$$2. \sum_{r=1}^n c = cn$$

$$3. \sum_{r=1}^n r = \frac{n(n+1)}{2}$$

$$4. \sum_{r=1}^n r^2 = \frac{n(n+1)(2n+1)}{6}$$

$$5. \sum_{r=1}^n r^3 = \left(\frac{n(n+1)}{2}\right)^2$$

Binomial Theorem for any positive integer, n

$$(a+x)^n = a^n + {}^n C_1 a^{n-1} x + {}^n C_2 a^{n-2} x^2 + {}^n C_3 a^{n-3} x^3 + {}^n C_4 a^{n-4} x^4 + \dots + x^n = \sum_{r=0}^n {}^n C_r a^{n-r} x^r$$

Binomial Theorem when n is not a positive integer

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!} x^2 + \frac{n(n-1)(n-2)}{3!} x^3 + \dots$$

Vector

$$a = a_1 i + a_2 j + a_3 k \text{ and } b = b_1 i + b_2 j + b_3 k \text{ and } \theta \text{ is an angle between } a \text{ and } b.$$

$$(i) \text{ Magnitude: } |a| = \sqrt{a_1^2 + a_2^2 + a_3^2}$$

$$(ii) \text{ Scalar Product: } a \cdot b = |a||b|\cos\theta ; \text{ where } a \cdot b = a_1 b_1 + a_2 b_2 + a_3 b_3$$

Complex Numbers

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

$$\theta = \tan^{-1} \frac{b}{a}$$

$$z = r(\cos\theta + i \sin\theta)$$

$$z^n = r^n(\cos n\theta + i \sin n\theta)$$

