



**KOLEJ YAYASAN PELAJARAN JOHOR
FINAL EXAMINATION**

COURSE NAME : ENGINEERING MATHEMATICS 2
COURSE CODE : MAT 1022
SESSION : JUNE 2024
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 **7** printed pages including front page
*Kertas soalan ini mengandungi **7** muka surat termasuk kulit hadapan*

PART A/ BAHAGIAN A

This part contains of **SIX (6)** questions. Answer **ALL** question in the answering booklet.
Bahagian ini mempunyai ENAM (6) soalan. Jawab SEMUA soalan di dalam buku jawapan.

QUESTION 1/ SOALAN 1

- a) In an arithmetic progression, the sum of the first four terms is 26 and the 8th term is 34. Find the first term and the common difference of the progression.

Dalam suatu jangjang aritmetik, hasil tambah empat sebutan pertama ialah 26 dan sebutan ke-8 ialah 34. Cari sebutan pertama dan beza sepunya jangjang itu.

(4 marks/ 4 markah)

- b) Write the following as a series;

Tuliskan berikut sebagai suatu siri;

$$\sum_{r=1}^n r^2(2r - 7)$$

(2 marks/ 2 markah)

- c) Find the sum of the following series;

Dapatkan hasil tambah bagi siri berikut;

$$1.11 + 2.14 + 3.17 + \dots + n(3n + 8)$$

(4 marks/ 4 markah)

QUESTION 2/ SOALAN 2

- a) Find the middle term in the expansion of;

Dapatkan sebutan pertengahan dalam kembangan;

$$(6 + 4x)^6$$

(3 marks/ 3 markah)

- b) Given the binomial function;

Diberi fungsi binomial;

$$(1 + 3x)^{\frac{1}{3}}$$

- i. Expand the binomial function above in an ascending power of x up to the term in x^3 .

Kembangkan fungsi binomial di atas dengan kuasa x menaik sehingga sebutan dalam x^3 .

(2 marks/ 2 markah)

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

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

(5 marks/ 5 markah)

QUESTION 3/ SOALAN 3

- a) Find the matrix of;

Dapatkan matriks bagi;

$$\begin{pmatrix} 0 & -2 \\ 5 & 1 \\ 3 & 8 \end{pmatrix} \begin{pmatrix} 6 & -8 \\ -3 & 6 \end{pmatrix}$$

(5 marks/ 5 markah)

- b) Given matrix;

Diberi matriks;

$$D = \begin{pmatrix} 4 & 3x - 2 \\ y + 11 & 7 \end{pmatrix}, E = \begin{pmatrix} -2 & x - 3 \\ y & -4 \end{pmatrix}, D + E = \begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$$

Find the value of x and y .*Dapatkan nilai x dan y .***(3 marks/ 3 markah)**

- c) Find the inverse of matrix;

Dapatkan songsangan bagi matriks;

$$\begin{pmatrix} 2 & 1 & 0 \\ 3 & 0 & 7 \\ -9 & -5 & 1 \end{pmatrix}$$

by using adjoint method.

*dengan menggunakan kaedah adjoin.***(6 marks/ 6 markah)**

QUESTION 4/ SOALAN 4

Solve the linear equation by using the Crammer's Rule.

Selesaikan persamaan linear berikut dengan menggunakan Petua Kramer.

$$x - 3y + 2z = 0$$

$$x + y + z = 1$$

$$x + y + 2z = 0$$

(7 marks/ 7 markah)

QUESTION 5/ SOALAN 5

Given three vector $a = 3i + 5j + 2k$, $b = i + 3j + 2k$ and $c = i + k$

Diberi tiga vektor $a = 3i + 5j + 2k$, $b = i + 3j + 2k$ dan $c = i + k$.

- a) Find the vector $a - 2c$.

Dapatkan vektor $a - 2c$.

(2 marks/ 2 markah)

- b) Find the angle between the vectors a and c .

Dapatkan sudut di antara vektor a dan c .

(4 marks/ 4 markah)

- c) Find the area of parallelogram with sides vector b and vector c .

Dapatkan luas parallelogram yang bersisikan vektor b dan vektor c .

(4 marks/ 4 markah)

QUESTION 6/ SOALAN 6

a) Simplify;

Ringkaskan;

i. $3i^2 - 2(5 + 6i) + 2$

ii. $\frac{1 - 3i}{2 + i}$

(4 marks/ 4 markah)b) Find the polar representation of $z = -2 - 2i$. Hence, find z^5 in polar form.*Dapatkan perwakilan kutub bagi $z = -2 - 2i$. Seterusnya, dapatkan z^5 dalam bentuk kutub.***(5 marks/ 5 markah)****END OF QUESTION PAPER/ KERTAS SOALAN TAMAT**

LIST OF FORMULA

SENARAI RUMUS

Arithmetic Progression

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

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

Theorems of Finite Series

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

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

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

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

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

Geometric Progression

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

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

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

$a = a_1i + a_2j + a_3k$ and $b = b_1i + b_2j + b_3k$ and θ is an angle between a and b .

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

(ii) **Scalar Product:** $a \cdot b = |a||b|\cos\theta$; where $a \cdot b = a_1b_1 + a_2b_2 + a_3b_3$

Complex Numbers

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

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

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

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

