KOLEJ YAYASAN PELAJARAN JOHOR
ONLINE FINAL EXAMINATION

COURSE NAME	**:**	**ENGINEERING MATHEMATICS 2**
COURSE CODE	**:**	**MAT 1022**
SESSION	**:**	**JUNE 2022**
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.   Answer ALL questions in the answer sheet which is A4 size paper (or other paper with the consent of the relevant lecturer). /
     Jawab SEMUA soalan di dalam kertas jawapan iaitu kertas bersaiz A4 (atau lain-lain kertas dengan persetujuan pensyarah berkaitan).

3.   Write your details as follows in the upper left corner for each answer sheet: /
     Tulis butiran anda sepertimana berikut di penjuru atas kiri bagi setiap kertas jawapan:
       i.   Student Full Name / *Nama Penuh Pelajar*
       ii.   Identification Card (I/C) No. / *No. Kad Pengenalan*
       iii.   Class Section / *Seksyen Kelas*
       iv.   Course Code / *Kod Kursus*
       v.   Course Name / *Nama Kursus*
       vi.   Lecturer Name / *Nama Pensyarah*

4.   Each answer sheet must have a page number written at the bottom right corner. /
     Setiap helai kertas jawapan mesti ditulis nombor muka surat di penjuru bawah kanan.

5.   Answers should be **neat and clear in handwritten form**. /
     Jawapan hendaklah ditulis tangan, kemas dan jelas.

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 answer sheet.

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

QUESTION 1/ *SOALAN 1*

a) The fifth term of a geometric series is 252 and the common ratio is $\frac{1}{2}$. Find the first term and the sum of the first 10th term.

Sebutan ke lima bagi suatu siri geometric ialah 252 dan nisbah sepunya ialah $\frac{1}{2}$.

Dapatkan sebutan pertama dan hasil tambah sepuluh sebutan pertama.

(3 marks / *markah*)

b) Express the series $-7 - 1 + 5 + 11 + \cdots + 89$ in the form $\sum_{r=1}^{n} U_r$.

Nyatakan siri $-7 - 1 + 5 + 11 + \cdots + 89$ dalam bentuk $\sum_{r=1}^{n} U_r$

(3 marks / *markah*)

c) Find the sum of the following series;

Dapatkan hasil tambah bagi siri berikut;

$$1 \cdot 5 + 2 \cdot 8 + 3 \cdot 11 + \cdots + n(3n + 2)$$

(3 marks / *markah*)

QUESTION 2/ *SOALAN 2*

a) Find the term involving x^4 in the expansion of;

Dapatkan sebutan yang melibatkan x^4 dalam kembangan;

$$(2 + 4x^2)^7$$

(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 dalamx^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*

a)   Given;

Diberi;

$$A = \begin{pmatrix} 3 & 1 & 2 \\ 3 & 2 & 2 \\ 1 & 0 & 1 \end{pmatrix}, \qquad B = \begin{pmatrix} 9 & -5 \\ 2 & 4 \\ -11 & 2 \end{pmatrix}, \quad C = \begin{pmatrix} 6 & 15 & 3 \\ -8 & -10 & 2 \end{pmatrix}$$

Find the matrix

Dapatkan matriks

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

(3 marks / *markah*)

ii. CB

(2 marks / *markah*)

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

Dapatkan songsangan bagi matriks A dengan menggunakan kaedah adjoin.

(5 marks / *markah*)

QUESTION 4/ *SOALAN 4*

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

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

$$x + 2y + 3z = 6$$
$$2x - 3y + 2z = 14$$
$$3x + y - z = -2$$

(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 $\underset{\sim}{a} = 4i - 2j + k$, $\underset{\sim}{b} = i - 3j + 2k$ and $\underset{\sim}{c} = i - 5j - k$.

Diberi tiga vektor $\underset{\sim}{a} = 4i - 2j + k$, $\underset{\sim}{b} = i - 3j + 2k$ dan $\underset{\sim}{c} = i - 5j - k$.

a) Find the vector $\left(\underset{\sim}{a} + 2\underset{\sim}{b} \right)$.

Dapatkan vektor $\left(\underset{\sim}{a} + 2\underset{\sim}{b} \right)$.

(2 marks / *markah*)

b) Find the angle between the vectors $\underset{\sim}{a}$ and $\underset{\sim}{c}$.

Dapatkan sudut di antara vektor $\underset{\sim}{a}$ dan $\underset{\sim}{c}$.

(4 marks / *markah*)

c) Find the area of parallelogram with sides vectors $\underset{\sim}{b}$ and $\underset{\sim}{c}$.

Dapatkan luas parallelogram yang bersisikan vektor $\underset{\sim}{b}$ dan $\underset{\sim}{c}$.

(3 marks / *markah*)

QUESTION 6/ *SOALAN 6*

a) Simplify;

Ringkaskan;

i. $4i^2 - 2(5 - 11i) + 3$

(2 marks / *markah*)

ii. $\dfrac{5 - i}{-8i}$

(2 marks / *markah*)

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

Selesaikan persamaan berikut untuk nilai nyata x dan y.

$$x - 2yi = (1 + 2i) + (3 - xi)$$

(3 marks / *markah*)

c) Find the polar representation of $z = -1 - \sqrt{3}i$. Hence, find z^4 in polar form.

Dapatkan perwakilan kutub bagi $z = -1 - \sqrt{3}i$. Seterusnya, dapatkan z^4 dalam bentuk kutub.

(4 marks / *markah*)

[60 MARKS / *MARKAH*]

END OF QUESTION PAPER/ *KERTAS SOALAN TAMAT*

LIST OF FORMULA

SENARAI RUMUS

Arithmetic Progression

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

$S_n = \dfrac{n}{2}\left(2a + (n-1)d\right)$

Geometric Progression

$a_n = ar^{n-1}$

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

Theorems of Finite Series

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

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

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

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

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

Binomial Theorem for any positive integer, n

$(a+x)^n = a^n + {}^nC_1 a^{n-1}x + {}^nC_2 a^{n-2}x^2 + {}^nC_3 a^{n-3}x^3 + {}^nC_4 a^{n-4}x^4 + ... + x^n = \displaystyle\sum_{r=0}^{n} {}^nC_r a^{n-r}x^r$

Binomial Theorem when n is not a positive integer

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

Vector

$a = a_1 i + a_2 j + a_3 k$ **and** $b = b_1 i + b_2 j + b_3 k$ **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** $a \cdot b = a_1 b_1 + a_2 b_2 + a_3 b_3$

Complex Numbers

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

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

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

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