FINAL
Alternative Assessment

Session	:	**April 2022**
Programme	:	Foundation in Science (CFSI)
Course	:	**MAT1211: Mathematics 2**
Date of Examination	:	5 August 2022 (Friday)
Time	:	9:00am – 11:30am Reading Time : Nil
Duration	:	2 hours + 30 minutes (uploading time)
Special Instructions	:	

This paper consists of **FOUR (4)** questions. Answer **ALL** questions.
All questions carry equal marks. Working must be shown.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Nil

Examiner(s)	:	**Ms. Siti Syazwani Sazali**
Chief Moderator	:	Ms. Nadia Hanim Abd Gahni

*This paper consists of **5** printed pages, including the cover page.*

FOUNDATION IN SCIENCES PROGRAMME (CFSI)
MAT1211: MATHEMATICS 2
FINAL ALTERNATIVE ASSESSMENT: APRIL 2022 SESSION

Instructions: This paper consists of FOUR (4) questions. Answer ALL questions in the foolscap paper. All questions carry equal marks.

Question 1

(a) Given $z = 6 - 2i$ and $w = 4 + 3i$.

i. $\frac{\bar{z}}{w}$

(3 marks)

ii. wz

(2 marks)

(b) Find all the roots for the given equation by using DeMoivre's Theorem.

$$z^2 - 5i = 0$$

(5 marks)

(c) i. If $A = \begin{bmatrix} 3 & -4 \\ -1 & 2 \end{bmatrix}$, find matrix B such that $AB = I$.

(3 marks)

ii. By using matrix A in part (i), show that $A + C = C + A$ but $A \cdot C \neq C \cdot A$, where

$$C = \begin{bmatrix} 1 & 2 \\ 2 & 5 \end{bmatrix}$$

(5 marks)

(d) A system of linear equations can be written in the matrix form $AX = B$, where

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 3 \\ 1 & -3 & 1 \end{bmatrix}, X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, \text{ and } B = \begin{bmatrix} 2 \\ 9 \\ 10 \end{bmatrix}$$

Find the value of x,y and z by using Cramer's rule.

(7 marks)

Question 2

(a) Evaluate $\int_2^4 \frac{1}{x^3+1}dx$ where $n = 4$ by using:

(Give your answer correct to 4 decimal places)

i. Trapezoidal Rule.

(7 marks)

ii. Simpson's Rule.

(2 marks)

(b) Given the initial-value problem,

$$y' + 2y = 2 - e^{-4t}, y(0) = 1$$

Use Euler's method with a step size, $h = 0.1$ to find the approximate value of the solution at $t = 0.1$, 0.2, 0.3,0.4, and 0.5. Perform all the calculation correct to 4 decimal places.

(6 marks)

(c) Find the Taylor's series for $f(x) = \ln x$ about $x = 1$ up to first three non-zero terms.

(6 marks)

(d) Determine the first three non-zero terms Maclaurin expansion for the function $f(x) = e^{-x}$.

(4 marks)

Question 3

(a) Given the function $z = x^3y^2 - 3xy^3$. Find

i. f_{x^2}

(2 marks)

ii. f_{y^2}

(1 marks)

iii. f_{xy}

(1 marks)

iv. f_{yx}

(1 marks)

(b) i. Show that the differential equation $(x - y)\frac{dy}{dx} = x + 2y$ is a homogenous differential equation.

(4 marks)

ii. Solve the differential equation $\frac{dy}{dx} = \frac{6x^2}{2y+\cos y}$ using separation of variables.

(5 marks)

(c) Solve the following differential equations by using Integrating Factor.

$$ds = (te^{4t} + 4s)dt$$

(5 marks)

(d) Find the general solution for the non-homogenous differential equation below using method of undetermined coefficients.

$$y'' - y' - 2y = 2e^{3x}$$

(6 marks)

Question 4

(a) The table shows the length of ribbon in a box.

Length (cm)	26-30	31-35	36-40	41-45	46-50
No. of ribbon	14	18	26	30	12

Find

i. mean

(3 marks)

ii. median

(3 marks)

iii. variance and standard deviation

(4 marks)

(b) A box contains 2 red, 3 white and 4 blue balls. Two balls are drawn from the box without replacement. Find the probability that both balls are

i. the same colour.

(3 marks)

ii. not white.

(3 marks)

(c) Given the position vectors A and B are $\begin{pmatrix} -3 \\ 6 \\ 3 \end{pmatrix}$ and $\begin{pmatrix} -1 \\ 2 \\ 4 \end{pmatrix}$ relative to an origin.

i. Calculate angle AOB.

(3 marks)

ii. Find the unit vector of $\overrightarrow{AB}$.

(3 marks)

(d) If $\vec{a} = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}, \vec{b} = \begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}$ and $\vec{c} = \begin{pmatrix} 1 \\ 3 \\ -1 \end{pmatrix}$. Find the value of p such that $\vec{a}$ is perpendicular to $p\vec{b} + \vec{c}$.

(3 marks)

~THE END~