INTI International College Penang

FINAL
Alternative Assessment

Session	:	**April 2021**
Programme	:	Foundation in Science (CFSI)
Course	:	**MAT1211: Mathematics 2**
Date of Examination	:	27 July 2021 (Tuesday)
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)	:	**Dr. Nurulanati Othman**
Chief Moderator	:	Ms. Nurul Asyima Zulkeflee

*This paper consists of **4** printed pages, including the cover page.*

FOUNDATION IN SCIENCE (CFSI)
MAT1211: MATHEMATICS 2
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

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

Question 1

(a) Given the formula of voltage, $V = I\,R$, where I and R denote current and resistance, respectively.

(i) Given $V = 45 + 10i$ and $R = 3 + 4i$, find the current, I. Give your answer in standard Cartesian and polar forms.

(7 marks)

(ii) Hence, use De Moivre's theorem to evaluate I^2, in polar form.

(3 marks)

(b) Mechanic A spends a total of 4.5 hours to repair 2 cars, 1 motorcycle and 1 bicycle. Mechanic B spends 7 hours to repair 3 cars, 2 motorcycles and 1 bicycle while Mechanic C spends 6 hours to repair 1 car, 3 motorcycles and 3 bicycles. Assuming the hours taken to repair each vehicle is the same for every mechanic, write a system of linear equations for these statements and a corresponding matrix equation for it. Use Gauss-Jordan elimination method to find the hours needed for repairing each vehicle.

(15 marks)

Question 2

(a) Evaluate

$$\int_0^{\pi} \cos(\sin x)\ dx$$

using the trapezoidal rule by dividing the interval into 4 sub-intervals, giving your answer correct to four (4) decimal places.

(8 marks)

(b) By using the formula from the Formula Booklet 1, find the Maclaurin series for

$$f(x) = e^{2x} \ln(x + 1)$$

up to and including the term in x^4. Hence, approximate $\int_0^{0.5} 3f(x)\ dx$ correct to four (4) decimal places.

(9 marks)

(c) The pressure P, temperature T, and volume V of a confined gas are related by $P = k\frac{T}{V}$, where k is a constant. Use partial derivatives to approximate the percentage change in pressure if the temperature of the gas is increased 3% and the volume is increased 5%.

(8 marks)

Question 3

(a) A RC series circuit can be described by the following differential equation

$$RC\frac{dV}{dt} + V = 15e^{-\frac{t}{RC}}$$

where R and C are constants given as $R = 10\ \Omega$, $C = 0.1$ F, whereas V is the voltage and t is time (seconds). If the initial voltage is 1 V, find the voltage V in circuit at $t = 2\ s$. Use a method with an integrating factor and give your answer in terms of e.

(12 marks)

(b) Solve the following non-homogeneous second-order differential equation using the undetermined coefficient method.

$$y'' + 4y' + 4y = 2x^2 - 3$$

(13 marks)

Question 4

(a) The position vectors of points P and Q are $\begin{pmatrix} -1 \\ 8 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ 4 \\ 6 \end{pmatrix}$, respectively.

(i) Calculate $\angle POQ = \theta$, giving your answer in three decimal places of radian.

(5 marks)

(ii) The point R is given such that $\overrightarrow{PR} = 3\overrightarrow{PQ}$. Find the unit vector in the direction of $\overrightarrow{OR}$.

(5 marks)

(b) **Table A** shows the waiting time for 40 passengers at a bus stop.

Table A

Time (minutes)	1 – 4	5 – 8	9 – 12	13 – 16	17 – 20	21 – 24
Number of passengers	2	7	13	10	5	3

(i) Copy and complete **Table B**.

Table B

Class boundary	Cumulative frequency	x (x: midpoint)	fx	fx^2
0.5 – 4.5				
4.5 – 8.5				
8.5 – 12.5				
12.5 – 16.5				
16.5 – 20.5				
20.5 – 24.5				
			$\sum fx =$	$\sum fx^2 =$

(4 marks)

(ii) Find the mean, mode, variance, and standard deviation of the times.

(6 marks)

(c) There are 30 red marbles and 40 blue marbles in a box. Then k blue marbles are added to the box so that the probability of obtaining a blue marble from the box is $\frac{2}{3}$. Find the value of k.

(5 marks)

-THE END-

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