INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	January 2019
Programme	:	Foundation In Science (CFSI)
Course	:	**MAT1211: Mathematics 2**
Date of Examination	:	11 March 2019 (Monday)
Time	:	11:00am – 1:00pm Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

This paper consists of **FIVE (5)** questions. Answer **any FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Formula Booklet 1

Examiner(s)	:	**Michael Chong**
Moderator	:	Dr. Ch'ng Pei Eng

This paper consists of 6 printed pages, including the cover page

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
MAT1211: MATHEMATICS 2
FINAL EXAMINATION: JANUARY 2019 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) If $z_1 = 2+5i$ and $z_2 = 3-2i$,

(i) find $z_1 + z_2$ in the form $a+bi$. (2 marks)

(ii) express $(z_1 z_2)^2$ in the form $a+bi$. (5 marks)

(b) Use De Moivre's Theorem to evaluate the value of $(\sqrt{27}-9i)^6$ in complex form.

(5 marks)

(c) Use the Gaussian elimination method (row echelon form) to solve the system of linear equations.

$$\begin{aligned} -4x+6y-2z &= 2 \\ 3x+6y-3z &= 12 \\ -2x-y+z &= -3 \end{aligned}$$

(8 marks)

(d) Apply Cramer's rule to solve the following system of linear equations:

$$\begin{aligned} x+y+z &= 5 \\ 4x+6y+10z &= 16 \\ 4x+5z &= 2 \end{aligned}$$

(5 marks)

Question 2

(a) Given that $z^2 = -5 - 12i$, solve for z.

(3 marks)

(b) Use Simpson's rule with 6 intervals to obtain an approximate value of the integral $\int_1^4 \sqrt{2+x^2}\,dx$. Round off your answer to 4 decimal places.

(7 marks)

(c) Using the Euler's method with step size of 0.1, find the approximate value of y at $x = 0.4$ of the differential equation $\frac{dy}{dx} - e^{-4x} = 2y - 2$ with the initial condition $y(0) = 1$. Round off your answer to 4 decimal places.

(6 marks)

(d) Solve the following problems:

(i) Find the first four non-zero terms of the Taylor's series for $f(x) = \ln x$ about $x = 1$. Hence, approximate $f(x) = \ln x$ at $x = 1.1$.

(5 marks)

(ii) Use the Maclaurin series to find the sum to infinity for $f(x) = x^4 e^{3x}$.

(4 marks)

Question 3

(a) The following frequency table shows the range of cost for mobile services of 20 students.

Cost of mobile services (RM)	10-14	15-19	20-24	25-29	30-34
Number of students (frequency)	4	8	5	2	1

Find the:

(i) mean (3 marks)

(ii) median (4 marks)

(iii) standard deviation (5 marks)

(b) Find all the second-order partial derivatives of $f(x, y, z) = x \sin y + y^2 \cos x + 2xy^3z^4$.

(8 marks)

(c) Find the rate of change of the volume V of a rectangular box when its length l is 10 cm and is increasing at the rate of 2 cm/s, its width w is 5 cm, and is increasing at the rate of 1 cm/s, and its height h is 3 cm and is increasing at the rate of 2 cm/s.

(5 marks)

Question 4

(a) Find the first three non-zero terms of the Maclaurin series for $f(x) = \sin^2 x$.

(5 marks)

(b) Solve $\frac{dy}{dx} + \frac{3y}{x} = 4$ using the integrating factor method.

(5 marks)

(c) Find the general solution of the differential equation $y'' + 7y' + 12y = 3e^{2x}$.

(9 marks)

(d) Find the particular solution of the differential equation $y'' - 6y' + 9y = 0$, with the initial conditions $y(0) = 2,\ y'(0) = 0$.

(6 marks)

Question 5

(a) Given the vectors, $\mathbf{a} = 3\mathbf{i} + 2\mathbf{j} - 5\mathbf{k}$ and $\mathbf{b} = 5\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$. Find the angle between the two vectors, give your answer in degrees and round off to two decimal places.

(6 marks)

(b) Given $\mathbf{a} = (2, -3, 5)$ and $\mathbf{b} = (1, 3, -2)$, find the resultant vector $\mathbf{(b - a)}$ and its magnitude.

(4 marks)

(c) Three fair dices are rolled, find the probability that the sum of the three dices outcome is

(i) 10.

(3 marks)

(ii) 10 with all three dices having different numbers.

(4 marks)

(d) Solve the following differential equations:

(i) $\frac{dy}{dx} = e^{-3y}(x^2 - 2)$

(4 marks)

(ii) $\frac{dy}{dx} = 2y^2x^4$

(4 marks)

~ The End ~