INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	APRIL 2018
Programme	:	Foundation In Science (CFSI)
Course	:	**MAT1211: MATHEMATICS II**
Date of Examination	:	31st July 2018 (Tuesday)
Time	:	8:00 AM – 10:00AM Reading Time : NIL
Duration	:	2 HOURS
Special Instructions	:	

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 :

Booklet 1

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

*This paper consist of **6** printed pages, including the cover page.*

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FOUNDATION IN SCIENCE (CFSI)
MAT1211: MATHEMATICS II
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Question 1

(a) If $z_1 = 5+3i$ and $z_2 = 2-9i$, express $z_1 z_2$ in the form $a+bi$.

(3 marks)

(b) Use De Moivre's Theorem to evaluate the value of $(5-5i)^6$ in polar form.

(5 marks)

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

$$-2x+3y-z=1$$
$$x+2y-z=4$$
$$-2x-y+z=-3$$

(10 marks)

(d) Use Trapezium rule with 6 intervals to obtain an approximate value of the integral $\int_1^4 \sqrt{3+x^2}\,dx$. Round off your answer to 4 decimal places.

(7 marks)

Question 2

(a) If $z_1 = 6+2i$ and $z_2 = 2-2i$, express $\frac{z_1}{z_2}$ in exponential form.

(3 marks)

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

$$2x + 2y + 2z = 10$$
$$2x + 3y + 5z = 8$$
$$4x + 5z = 2$$

(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 $\frac{dy}{dx} + e^{-4x} = 2 - 2y$ 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 $f(x) = \frac{2}{x^2}$ about $x = 1$.

Hence, approximate $f(x) = \frac{2}{x^2}$ at $x = 1.1$.

(5 marks)

(ii) Find the first four non-zero terms of the Taylor's series for $f(x) = 2e^{2x}$ at $x = 1$.
Hence, approximate $f(x) = 2e^{2x}$ at $x = 1.1$.

(4 marks)

Question 3

(a) The following frequency table shows the number of children per family for 50 families.

Number of child	1	2	3	4	5
Number of families (frequency)	6	14	18	7	5

Find the:

(i) mean

(2 marks)

(ii) median

(2 marks)

(iii) mode

(1 mark)

(iv) standard deviation

(3 marks)

(b) Prove that $f_{xy} = f_{yx}, f_{xz} = f_{zx}$ and $f_{yz} = f_{zy}$ for $f(x, y, z) = x^2 \sin y + y^2 \cos x + xy^2 z^2$.

(12 marks)

(c) A snack company produces cylinder cans for the packaging and storage of their snacks. The cans are required to be a circular cylinder with height of 20.7 cm and radius of 3.5 cm. If there is a percentage error of no more than 0.3% in height and 0.2% in radius. What is the maximum error in the volume of the can?

(5 marks)

Question 4

(a) Given the vectors, $\mathbf{a} = 6\mathbf{i} + 9\mathbf{j} - 5\mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} - 3\mathbf{j} + 5\mathbf{k}$. Find the angle between the two vectors, give your answer in degrees and round off to two decimal places.

(6 marks)

(b) Find the resultant vector $(\mathbf{b} - \mathbf{a})$ and its magnitude, given $\mathbf{a} = (1, -3, 2)$ and $\mathbf{b} = (3, 4, -5)$.

(4 marks)

(c) 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 color.

(3 marks)

(ii) not white.

(3 marks)

(d) Find the particular solution of the differential equation $y''+4y'+4y=0$, with the initial conditions $y(0)=2,\ y'(0)=0$.

(9 marks)

Question 5

(a) Use the Maclaurin series to find the sum to infinity for

(i) $f(x) = x\cos x$.

(2 marks)

(ii) $f(x) = x^4 e^{3x}$.

(3 marks)

(b) Solve $\frac{dy}{dx} + \frac{2y}{x} = 3$ using the integrating factor method.

(5 marks)

(c) Find the general solution of the differential equation $y'' - 3y' - 4y = 3e^{2x}$.

(9 marks)

(d) Solve the following differential equations

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

(3 marks)

(ii) $\frac{dy}{dx} = 3y^3x^2$.

(3 marks)

~ The End ~

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