INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

Final
Examination Paper

(COVER PAGE)

Session	:	January 2018
Programme	:	FOUNDATION IN SCIENCE (CFSI)
Course	:	**MAT1211: MATHEMATICS II**
Date of Examination	:	5th March 2018 (Monday)
Time	:	0800am-1000am 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 Calculator

Materials provided :

Answer booklet and Booklet 1

Examiner(s) : **Mr. Michael Chong Sueng**

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 II
FINAL EXAMINATION: JANUARY 2018 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 $z_2 = 3-2i$, express $\frac{z_1}{z_2}$ in the form $a+bi$.

(3 marks)

(b) Use De Moivre's Theorem to evaluate $(3+3i)^4$ and express the results in polar form.

(5 Marks)

(c) Apply Cramer's rule to solve the following system of linear equations.

$$\begin{aligned} -2x + 3y - z &= 1 \\ x + 2y - z &= 4 \\ -2x - y + z &= -3 \end{aligned}$$

(7 marks)

(d) Use the Gauss-Jordan reduction method (reduced row echelon form) to solve the system of linear equations.

$$\begin{aligned} 2x + 2y + 2z &= 10 \\ 2x + 3y + 5z &= 8 \\ 4x + 5z &= 2 \end{aligned}$$

(10 marks)

Question 2

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

(3 marks)

(b) Use Simpson's rule with 6 intervals to obtain an approximate value of the integral $\int_1^4 \sqrt{1+x^3}\,dx$. Roundoff your answer to 3 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 $\frac{dy}{dx} - e^{-4x} = 2-2y$ with the initial condition $y(0) = 1$. Roundoff 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 $f(x) = \frac{1}{x^2}$ about $x = -1$. Hence approximate $f(x) = \frac{1}{x^2}$ at $x = -0.9$.

(5 marks)

(ii) Find the first four non-zero terms of the Taylor's series for $f(x) = e^x$ at $x = 2$. Hence Approximate $f(x) = e^x$ at $x = 2.1$.

(4 marks)

Question 3

(a) The table below shows the number of credits in the examinations for 50 students.

Number of credits	1	2	3	4	5
Number of students	6	14	18	7	5

Find the:

(i) mean

(2 marks)

(ii) median

(2 marks)

(iii) mode

(1 marks)

(iv) standard deviation of number of credits.

(3 marks)

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

(i) $f(x) = e^x$

(2 marks)

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

(3 marks)

(c) Prove that $f_{xy} = f_{yx}, f_{xz} = f_{zx}$ and $f_{yz} = f_{zy}$ for $f(x, y, z) = -2x^6y^2z + 8x^4y^{-3}$.

(12 marks)

Question 4

(a) Given the vectors, $\mathbf{a} = 4\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$ 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 roundoff to two decimal places.

(9 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 die and a coin are tossed together at random. Find the probability of getting

(i) a head

(1 mark)

(ii) a number greater than 2

(1 mark)

(iii) a head and a number greater than 2

(2 marks)

(iv) a head or a number greater than 2

(2 marks)

(d) Solve the following differential equations

(i) $\frac{dy}{dx} = e^{-y}(2x - 4)$.

(3 marks)

(ii) $\frac{dy}{dx} = 6y^2x$.

(3 marks)

Question 5

(a) Solve $\frac{dy}{dx}+\frac{y}{x}=1$ using the integrating factor method.

(5 marks)

(b) Find the general solution of the differential equation $y''-4y'-12y=3e^{5x}$

(9 marks)

(c) Find the particular solution of the differential equation $y''+3y'-4y=0$, with the initial conditions $y(0)=2,\ y'(0)=0$

(6 marks)

(d) The two sides forming the right-angled triangle are denoted by a and b. The hypotenuse is h. If there are possible errors of ± 0.5% in measuring hypotenuse a and b, given that a = 2cm and b = 3 cm, find the maximum possible error in calculating area of the right-angled triangle.

(5 marks)

~ The End ~

Foundation in Science Test Specification Table (TST)

Name of lecturer: MICHAEL CHONG
Subject name and code: MATHEMATICS II MAT1211
Session: Jan-18
Assessment: Final exam

Topic	Hrs spent on topic	% hrs	Marks allocated	CLO	C1	C2	C3	C4	C5	C6	Total marks developed
1	12	7.14	11	CLO 1			Q1a, 3m Q1b, 5m Q2a, 3m				11
2	24	14.29	17	CLO 1			Q1c, 7m Q1d, 10m				17
3	12	7.14	13	CLO 2			Q2b, 7m Q2c, 6m				13
4	12	7.14	14	CLO 2			Q2d, 9m Q3b, 5m				14
5	12	7.14	17	CLO 3			Q3c, 12m Q5d, 5m				17
6	24	14.29	11	CLO 4			Q4d, 6m Q5a, 5m				11
7	36	21.43	15	CLO 4			Q5b, 9m Q5c, 6m				15
8	12	7.14	13	CLO 5			Q4a, 9m Q4b, 4m				13
9	24	14.29	14	CLO 5			Q3a, 8m Q4c, 6m				14
Total	168	100.00	125								125