INTI INTERNATIONAL UNIVERSITY

FOUNDATION IN SCIENCE (CFSI)
MAT1211: MATHEMATICS 2
FINAL EXAMINATION: JUNE 2015 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) Find the inverse of *A* below by using elementary row operations.

$$A = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 1 & -1 \\ -1 & 0 & -2 \end{bmatrix}$$

(8 marks)

(b) Given that a complex number is $z = x + yi$, where x and y are real numbers.

(i) If $2x - 3y + 5i = -1 + (3y - x)i$, find the values of x and y.

(5 marks)

(ii) If $z_1 = \dfrac{z}{2 - i}$, express z_1 in polar form, giving the argument in terms of degrees and plot the graph.

(8 marks)

(iv) Apply DeMoivre's theorem to evaluate $z_1^{\,4}$, giving your answer in rectangular form.

(2 marks)

(v) Perform the operation $(z_1)(5 + 8i)$ and write the answer in the form $a + bi$.

(2 marks)

Question 2

(a) A group of 40 patients go to NCI hospital for medical checkup; the data below are the records of their blood cholesterol levels.

(i) Copy and complete the table below. (6 marks)

Class Interval	Frequency	Mid-point x	fx	fx^2
$170 \leq x < 180$	3			
$180 \leq x < 190$	6			
$190 \leq x < 200$	14			
$200 \leq x < 210$	8			
$210 \leq x < 220$	5			
$220 \leq x < 230$	4			
	$\sum f =$		$\sum fx =$	$\sum fx^2 =$

(ii) Find the mean of the data.

(2 marks)

(iii) Find the mode of the data using formula.

(3 marks)

(iv) Find the median of the data using formula.

(3 marks)

(v) Find the variance of the data using formula.

(3 marks)

(b) (i) A box contains 4 white Mashimaro and 6 yellow Mashimaro. If two Mashimaro are picked at random one after another without replacement from the box, what is the probability of picking both white Mashimaro?

(2 marks)

(ii) There are 100 families in a village, 44 of them have star fruit trees, 34 have durian trees and 14 have both. A family is selected at random from the village. Find the probability that the family selected has star fruit trees or durian trees.

(2 marks)

(iii) Ten cards numbered from 1 to 10 are placed in a box. Two cards are picked at random from the box without replacement. Find the probability of picking a number that is prime number.

(2 marks)

(iv) Given that there are Bag A and Bag B. Bag A contains 5 white Mashimaro and 4 red Mashimaro. Bag B contains 3 white Mashimaro and 2 red Mashimaro. A Mashimaro is picked at random from Bag A or Bag B and the colour is noted. Find the probability that a white Mashimaro is chosen.

(2 marks)

Question 3

(a) Given that the system of linear equations is

$$\begin{aligned} x + y - z &= 0 \\ x - y + z &= 4 \\ x + y + z &= 10 \end{aligned}.$$

Find the determinant D_o Hence, use Cramer's rule to solve the system of linear equations.

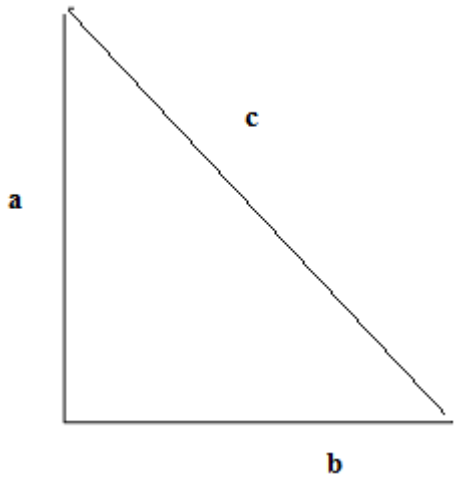
(7 marks)

(b) Solve differential equation $(x-3)\frac{dy}{dx} - y = (x-3)^3$ by finding the integrating factor when $x = 5$ and $y = 15$.

(7 marks)

(c) Three sides of a right triangle is denoted by a, b and c as below. If there are possible errors of $\pm 0.2\%$ in measuring a and b, find the maximum possible errors in calculating the area of triangle and the length of c.

(11 marks)



Question 4

(a)

(i) Find the angle between $\overline{A} = i - 2j - 2k$ and $\overline{B} = 3i + 3j + 2k$.

(5 marks)

(ii) Given that $A(1,-1,0), B(2,1,-1)$ and $C(1,-1,0), Q(2,1,-1)$ Determine a unit vector perpendicular to the plane of $\overline{AB} \times \overline{AC}$.

(7 marks)

(b) Find the general solution of the differential equation $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = \cos 2x.$

(13 marks)

Question 5

(a) Use the trapezium rule with 5 ordinates to find the approximate value of $\int_1^3 \frac{1}{\sqrt{(1+x^2)}} dx$, giving the values to three decimal places by copy and complete the **table X** given.

Table X

n	x_n	$f(x_n)$
0		
1		
2		
3		
4		

(5 marks)

(b) Find the particular solutions of the differential equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} - 6y = e^x \cos x.$ when $\frac{dy}{dx} = 0, x = 0$ and $y = 0.$

(15 marks)

(c) Use the method of determinant and inverse matrix of 2 x 2 to solve the system of linear equations:

$$2x + 5y = 26 \quad \text{and} \quad 2x + y = 10.$$

(5 marks)

--THE END--