MURANG'A UNIVERSITY EXAMINATION

A Constituent College of Jomo Kenyatta University of Agriculture and Technology

MATH SCI 1112-BASIC COMPUTING MATHEMATICS

DATE: 15TH DECEMBER, 2015 TIME: 2 HOURS

INSTRUCTIONS

ANSWER QUESTION **ONE** AND **ANY TWO** QUESTIONS FROM THE OTHER QUESTIO

QUESTION ONE COMPULSORY (30mks)

a) Copy and complete the truth table below: (4mks)

A	B	$\sim B$	$A \Rightarrow \sim B$
T	T		
T	F		
F	T		
F	F		

b) Let $A = \{2,4,6,8,10\}$ and $B = \{1,2,6,10\}$. Find

i. $A \cup B$

ii. $A \cap B$ (4mks)

c) If $f(x) = 4x + 2$, find

i. $f(4)$

ii. $(fof)(2)$ (4mks)

d) Simplify $z = \frac{1-i}{1+i}$ (3mks)

e) How many ways are there of arranging the letters of the word: (3mks)
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f) Find the determinant of the following matrix: (3mks)

$$\begin{bmatrix} 1 & 4 & -1 \\ 2 & 3 & -2 \\ -1 & 2 & 3 \end{bmatrix}$$

g) Simplify the following leaving your answer in factorial form:

16!+15! (2mks)

h) Convert the following as indicated:

i. 111_8 to base 10 (2mks)

ii. 696_{10} to base 16 (2mks)

iii. 10110101_2 to base 16 (3mks)

QUESTION 2 (20mks)

a) Solve the following system of linear equations using Cramers' rule. (6mks)

$2x + y + z = 1$

$3x + 2y + z = 2$

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

b) Let $f(x) = x^3 + 3x^2 - 2x - 2$ and $g(x) = x - 1$. Calculate:

i. $\frac{f(x)}{g(x)}$ (3mks)

ii. $(gof)(x)$ (3mks)

iii. $(f \bullet g)(x)$ (3mks)

iv. $g(x) - f(x)$ (2mks)

c) Convert 37_{10} to base 2 (3mks

QUESTION THREE (20mks)

a) Define the following terms: (5mks)

i. Premise

ii.Atomic sentence

iii.Tautology

iv.Compound sentence

v.Paradox

b) Show that the statement $A \Rightarrow B$ is logically equivalent to $\sim B \Rightarrow \sim A$ (5mks)

c) Solve the following quadratic equations:

i. $n^2 - 3n = 4$ (3mks)

ii. $2z^2 = z - 1$ (3mks)

d) Given $z_1 = 2 + 2i$ and $z_2 = 1 - 3i$, evaluate:

i. $z_1 + z_2$ (2mks)

ii. $i^3(z_2)$ (2mks)

QUESTION FOUR (20mks)

a) Define the term Set and give one example of a set. (2mks)

b) Let $\mathfrak{R} = \{0,1,2,3, \ldots \ldots \ldots, 100\}$ be the universal set. Compute the following:

i. $\{1,2,3\} \cup \{0,2,4.6\}$ (1mk)

ii. $\{1,6,8\} \cap \{4,9\}$ (2mk)

iii. $\{1,2, \ldots \ldots \ldots \ldots, 10\}^{c} \cap \{1,2,3,4, \ldots \ldots \ldots, 100\}$ (2mks)

c) Solve the equation:

${}^{x}P_2 = {}^{4}C_2$ (4mks)

d) How many different committees of 7 people can be chosen from a group of ten if only three people qualify for chairmanship. (3mks)

e) Find:

i. The range and the domain of the function: $f(x) = 2 + \sqrt{(1-x)}$. (3mks)

ii. The inverse of the function $f(x) = 2x + 1$ and hence evaluate $f^{-1}(9)$ (3mks)

QUESTION FIVE (20mks)

a) Determine:

i. The inverse of the matrix : $\begin{bmatrix} 1 & 4 & -1 \\ 2 & 3 & -2 \\ -1 & 2 & 3 \end{bmatrix}$ (4mks)

ii. Hence or otherwise, solve the system of linear equations below:

$x + 4y - z = 3$

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

$-x + 2y + 3z = 7$ (3mks)

b) Write down the atomic sentences in the compound sentence below, and hence construct the truth table: " John will visit peter unless it rains." (4mks)

c) Given that $A = \{1,4,6\}$ and $B = \{2,4,7\}$, evaluate:

i. $A \backslash B$ (2mks)

ii. Illustrate the results in (i) above on a Venn diagram. (2mks)

d) Given that $\mathbf{A} = \begin{bmatrix} 2 & -5 & 4 \\ 6 & 7 & 2 \\ 4 & 5 & 4 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} -2 & 6 & 7 \\ 3 & -4 & 6 \\ -5 & 8 & 4 \end{bmatrix}$ and $\mathbf{C} = \begin{bmatrix} 3 \\ 4 \\ -2 \end{bmatrix}$ evaluate:

i. **AC** and **BC** (3mks)

ii. **AC+BC**

(2mks)