# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

## *Faculty of Engineering and Technology*

## DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY
DICT 10A, DIT 2K 10J, DIT 10M

## EIT 2103 ECS 2215 ECS 2208: COMPUTATIONAL MATHEMATICS

SPECIAL/SUPPLEMENTARY EXAMINATION

**SERIES:** OCTOBER 2011

**TIME:** 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Answer booklet*

Answer question **ONE (COMPULSORY)** in section A and any other **TWO** questions from section B
This paper consists of **THREE** printed pages
Maximum marks for each part of a question are clearly shown.

## SECTION A (30 marks)

**Question 1 (Compulsory)**

a) Solve

$$\frac{2}{x+1} - \frac{1}{x-2} = -1$$
(i)

$$2(x-2)^2 - 4 = y$$
$$4x - y = 2$$
(ii)

b) Using 4 bit representation, evaluate the following arithmetic's in two's complement notation.

    (i) $14 - 8$
    (ii) $7 - 13$

c) Draw the symbol of a three input NOR operator and list all the possible outputs.     (4 marks)

d) Represent 13 as a BCD with the following methods Excess 3 and 2421     (4 marks)

e) Describe how Repetition Codes can be used as an error detection scheme     (3 marks)

f) Outline **FOUR** sources of errors in a transmitted signal     (3 marks)

g) Name **TWO** alphanumeric coding systems in use today     (2 marks)

## SECTION B (40 marks)

**Question 2 (20 marks)**

a) Form a system of NAND gates that can perform the operation of NOR gate     (4 marks)

b) Draw a truth table for $P \cdot T \cdot (P+Z)$.     (4 marks)

c) Draw the logic circuit for the Boolean expression $(A+C).(AD\,A.\overline{D})+A.C+C$ and represent a simple circuit with equivalent output and provide it's truth table.     (12 marks)

**Question 3 (20 marks)**

a) Represent the binary equivalent of decimal number 237 in gray code     (4 marks)

b) Difference between weighted and Non-weighted codes     (4 marks)

c) Using the method of 4-bit two's complement evaluate the following
   (i)  7 – 13
   (ii) 11 – 5

d) Solve 713 – 975 in BCD                                                                        (6 marks)

**Question 4 (20 marks)**

a) Find the solution set for the following system of equations.  Use crammer's rule
   $$4x - 2y - 3z = 8$$
   $$5x + 3y - 4z = 4$$
   $$6x - 4y - 5z = 12$$
                                                                                                (10 marks)

b) Expand the expression $(x + y)^7$.  Using the expansion, approximate the value of $1.9^7$ to 3.d.p
                                                                                                (5 marks)

c) Peter and Njeri travelled from Mombasa to Nairobi through a distance of 400km.  Njeri left Mombasa half an hour ealier than Peter.  Njeri arrived two hours later after Peter did.  If Peter was travelling at 20km//h faster than Njeri, determine the Peter's Speed.        (5 marks)

**Question 5 (20 marks)**

a) List any **FOUR** sources of errors in a transmitted signal                                 (4 marks)

b) Explain the effects of errors in a transmitted signal affect communication                (6 marks)

c) Differentiate the Parity check and Repetition code as error detection methods            (6 marks)

d) Rewrite the signals provided below with both even and odd parity check
   (i)  1010111
   (ii) 1001101