THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DIPLOMA IN INFORMATION TECHNOLOGY (DIT 10M)
YR 2 SEM I

ECS 2208: MATHEMATICS III

END OF SEMESTER EXAMINATIONS

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:
Answers **MUST** be written clearly within the answer booklets provided with the exam paper
Answer questions **ONE (COMPULSORY)** and any other **TWO** questions from section **B**
This paper consists of **THREE** printed pages

SECTION A (30 MARKS) – Answer all Questions in this section

Question 1 (Compulsory)

a) Solve

$$\frac{2}{x+1}-\frac{1}{x-2}=-1$$

(i) (3 marks)

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

(ii) (4 marks)

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

(i) 14 – 8 (3 marks)
(ii) 7 – 13 (4 marks)

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) – Answer any TWO questions from this section

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 $(A+C)\cdot\left(AD+A\cdot\overline{D}\right)+A\cdot C+C$ and represent a simple circuit with equivalent output and provide its truth table (12 marks)

Question 3 (20 marks)

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

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

c) Using the method of 4-bit two's complement evaluate the following (3 marks)
(i) 7 – 13
(ii) 11 – 5 (3 marks)

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 1.97^7 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 earlier than Peter. Njeri arrived two hours later after Peter did. If Peter was travelling at 20km/hr 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 (2 marks)
   (ii) 1001101 (2 marks)