



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)

$$(A + C) \cdot (AD + A \cdot \bar{D}) + A \cdot C + C$$

c) Draw the logic circuit for the Boolean expression 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)