



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DIPLOMA IN INFORMATION TECHNOLOGY (DIT)

END OF SEMESTER EXAMINATION

APRIL/MAY 2010 SERIES

MATHEMATICS

TIME: 2 HOURS

Instructions to Candidates

- Answer **ALL** Questions in Section **A** and any **TWO** from Section **B**.
- Show **ALL** your working.
- **ALL** mobile phones **MUST** be switched off.

SECTION A : COMPULSORY (30 Marks)

Question ONE

(a). Evaluate

(i). $11101 - 101011 + 1101011$ **(2 Marks)**

(ii). $1101001111 \div 1011$ **(4 Marks)**

(b). Convert the following numbers:

(i). 1101.0101_2 to Decimal **(3 Marks)**

(ii). $2CA9_{16}$ to Octal **(3 Marks)**

(c). Solve for the unknowns

(i). $3x + 5y = 9$
 $7x + 4y = -2$ **(3 Marks)**

(ii). $2xy + y = 10$
 $x + y = 4$ **(4 Marks)**

(d). Find the value of $\frac{1}{2}SP + 3S - P$ Given:

$A = \begin{pmatrix} 3 & 0 \\ 8 & 4 \end{pmatrix}$ and $P = \begin{pmatrix} 2 & 7 \\ 1 & 9 \end{pmatrix}$ **(4 Marks)**

(e). Draw the symbol of a NAND Gate and give its truth table. **(3 Marks)**

(f). List the weighted value for the following numbers.

(i). 110101_2 **(2 Marks)**

(ii). $4BC6_{16}$ **(2 Marks)**

SECTION B : (EACH QUESTION CARRIES 20 MARKS)

Question TWO

(a). Evaluate the following in BCD

(i). $473 - 729$ **(4 Marks)**

(ii). 13×6 **(6 Marks)**

(b). Express:

(i). 34_{16} in Gray Code **(3 Marks)**

(ii). Gray Code 10111011 in Decimal. **(3 Marks)**

(c). Write the following bits with odd and even parity.

(i). 1011001 **(2 Marks)**

(ii). 11010011 **(2 Marks)**

Question THREE

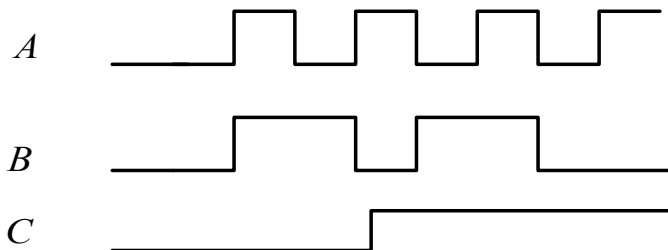
(a). Simplify the Boolean Algebra Expression below:

$$Q = \overline{ABC} + AB\overline{C} + ABC \quad \textbf{(4 Marks)}$$

(b). Implement the circuit of Q above in its simplest form. **(4 Marks)**

(c). Draw the truth table with all the possible outputs for the simplified expression of Q above. **(4 Marks)**

(d). Draw the output of the signals below when passed through an OR Gate.



(4 Marks)

- (e). Show how a NAND Gate can be used as an inverted Gate to perform the function of an AND Gate. **(4 Marks)**

Question FOUR

(a). Given:
$$A = \begin{pmatrix} 4 & -2 & -3 \\ 5 & 3 & -4 \\ 6 & -4 & -5 \end{pmatrix}$$

Find:

- (i). Determinant of A. **(2 Marks)**
(ii). Co-factor matrix of A. **(5 Marks)**
(iii). Inverse matrix of A. **(3 Marks)**
- (b). Solve:
$$\frac{2}{1+3x} - \frac{1}{2-x} = \frac{3}{7}$$
 (4 Marks)
- (c). A computer from ordered goods via courier services. If this van, travelled 20Km/hr faster, it would take two hours less to cover 1000Km. Calculate the speed of the van. **(6 Marks)**

Question FIVE

- (a). Evaluate the following:
- (i). ${}^{10}P_5$ **(1 Mark)**
(ii). ${}^8P_2 \times \frac{10!}{2! 28!}$ **(4 Marks)**
- (b). How many different ways can the Alphabets of the word “Accommodation” be rearranged. **(4 Marks)**
- (c). The 2010 DIT module III class is of 5 Gents and 4 ladies. Three students are selected to represent the Department in IEEE Projects from among the 9 members of the class.
- (i). Determine the number of ways the representatives can be chosen. **(4 Marks)**
(ii). The number of ways the representatives can be chosen if at least one members must be a lady. **(7 Marks)**