



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

**DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY
(DICT 2K 11M)**

EEE 2220: DIGITAL ELECTRONICS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions
 Answer question **ONE** and any other **TWO** questions
 Maximum marks for each part of a question are as shown
 This paper consists of **TWO** printed pages

SECTION A (COMPULSORY)

Question One (20 marks)

$$Y = (A + \bar{B})(\overline{A + B})(A.B)$$

- a) Give the Boolean Expression
 i) Draw the general Logic gate arrangement.
 ii) Realize using NAND gates only. **(10 marks)**
- b) Show how a NOR gate can be used as a universal gate. **(10 marks)**

SECTION B (Answer Any Two Questions)

Question Two (20 marks)

$$Y = \overline{\overline{A}.B.C} + (\overline{A + B + C})(\overline{A + B + C}) + (A.\overline{B}.C)$$

- a) Simplify arrangement of the simplified Expression. then draw the truth table and Logic gate **(10 marks)**
- b) Use a K – Map to minimize the Boolean Expression given by:
 $Y(A, B, C) = \sum_m (0,1,3,4,5)$
 i) $Y(A, B, C) = \sum_m (0,1,2,5,6)$
 ii) Draw the Truth Table of minimized expression. **(10 marks)**

Question Three (20 marks)

$$Y = A \cdot \overline{B} \cdot C + (\overline{A + B + C}) \cdot B$$

Given the Boolean Expression

- a) Draw the general logic gate arrangement
 b) Realize (a) above using NAND gates only
 c) Realize (a) above using NOR gates only **(20 marks)**

Question Four (20 marks)

- a) Describe the AND, NOR and NAND Logic gates. **(4 marks)**
- b) Given the Boolean Expressions below:
 $Y = (\overline{A \cdot B})(\overline{A \cdot B})(\overline{A \cdot B \cdot C + D})$
 i) $Y = (A + B + C)(A + \overline{B} + C)(\overline{A \cdot B})$
 ii) Simplify, draw the Truth table of the simplifier form and their logic gates arrangement. **(10 marks)**
- c) State the AND, OR, NOT and Demorgan's Law of Boolean algebra. **(6 marks)**

Question Five (20 marks)

- a) (i) Define a Flip-flop (2 marks)
(ii) Explain the Flip-flop operating characteristics. (3 marks)
- b) With the aid of a logic diagram, Truth table and Logic symbols describe the Negative Edge triggered S-R flip-flop. (6 marks)
- c) (i) Draw the symbols of J-K and D-type flip-flops. (4 marks)
(ii) Show the truth tables of the above (i) flip-flops. (4 marks)
(ii) State one advantages of D-type over J-K flip-flop (1 marks)