THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

Ukunda Campus

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

CERTIFICATE IN TECHNOLOGY –ELECTRICAL POWER ENGINEERING

EEE 1105: DIGITAL ELECTRONICS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2012
TIME: 2 HOURS

Instructions to Candidates:

This paper consists of **FIVE** questions

- *Answer Booklet*

Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Marks are indicated for each part of the question
This paper consists of **THREE** printed pages

Question One

a) Differentiate between the following terms
   (i) Analogue and digital representation (2 marks)
   (ii) Primary and secondary logic gates (2 marks)
   (iii) Weighted and Non weighted binary codes (2 marks)
   (iv) Min terms and Max terms (2 marks)

b) Define the term binary code as used in digital electronics (1 mark)

c) With the aid of a logic circuit show how a NAND gate can be used as an OR gate (3 marks)

d) Convert the following numbers into the specified equivalents
   (i) 93.625_{10} into its binary equivalent (4 marks)
   (ii) 206.104_{8} into its decimal equivalent (4 marks)

$$Y = \overline{A}C + B\overline{C} + ABC$$

e) Construct a logic circuit whose output is (5 marks)

$$Y = \overline{\left(\overline{A} + \overline{B}\right)}BC$$

f) Determine the logic level Y for a logic circuit with the output where A = 0, B = 1 and C =1 (4 marks)

g) State **ONE** major drawback of digital over analogue techniques (1 mark)

Question Two

a) Define the following terms
   (i) Number system (1 mark)
   (ii) Radix (1 mark)

b) Mention **FOUR** number systems that are commonly used in digital electronics (4 marks)

c) Convert the following Decimal numbers to their Hexadecimal equivalent
   (i) 650_{10} (4 marks)
   (ii) 4019.345_{10} (4 marks)

d) Subtract 1101_2 from 1010_2 using
   (i) 1's complement representation (2 marks)
   (ii) 2's complement representation (2 marks)

e) State **TWO** applications of number systems in digital electronics (2 marks)

Question Three

a) Briefly describe **FOUR** types of binary codes (8 marks)

b) State **TWO** applications of binary codes (2 marks)

c) Convert the following numbers into Binary Coded Decimals (BCD)

(i) 79_{10} (3 marks)
(ii) 93_{10} (3 marks)

d) Perform the following binary calculations
(i) 100101 + 100101 (2 marks)
(ii) 110.01 – 100.1 (2marks)

Question Four

a) Citing examples differentiate between basic and secondary logic gates (3 marks)

b) Define the term universality as used with NAND and NOR gates (1 mark)

$$Y = \overline{A} + B + C + \overline{\overline{A}D},$$

c) For the output

(i) Implement the logic circuit (5 marks)

(ii) Determine the truth table for the circuit (5 marks)

(iii) Determine the logic level Y given A = 1, B = 0, C = 1 and D = 0 (4 marks)

d) With the aid of a diagram show how a NAND gate can be implemented as an OR gate (2 marks)

Question Five

a) Describe the **TWO** standard forms of Boolean expressions (4 marks)

b) Simply the following the following Boolean expression

$$X = AB\overline{(\overline{A} + BC)},$$

Hence draw the simplified logic circuit (10 marks)

c) Construct a truth table for the simplified expression in (b) above and obtain the value of X

(6marks)