CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

CHUKA & EMBU

**SECOND YEAR EXAMINATION FOR THE AWARD OF
DIPLOMA IN COMPUTER SCIENCE**

COSC 0211: DIGITAL ELECTRONICS

STREAMS: DIP COMP.SCI (Y2S1)   **TIME: 2 HOURS**

DAY/DATE: FRIDAY 26/03/2021   **2.30 P.M. – 4.30 P.M**

INSTRUCTIONS:
- Answer question **ONE** and **TWO** other questions
- Do not write anything on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **NO** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely.
- Marks are awarded for clear and concise answers.

SECTION A (ANSWER ALL QUESTIONS IN THIS SECTION)

QUESTION ONE (30 MARKS)

a) By the aid of a diagram differentiate between a digital and analog signal   [4 marks]

b) Draw a logic circuit and truth table for $A + BC + C'$.   [4 marks]

c) Explain the De-Morgan Boolean law   [2 marks]

d) Derive the truth table for a two input NOR gate   [2 marks]

e) Sketch the standard symbols of the following basic logic gates and derive their truth tables.

   i.   OR gate   [2 marks]

   ii.   AND gate   [2 marks]

f) Consider a three input NAND gate, the inputs are A, B, and C. Derive the truth table and draw the symbol for the expression.   [4 marks]

g) Explain why NOR and NAND gate are referred to as universal gate [2 marks]

h) Differentiate between RAM and ROM as used in memory [4 marks]

i) Minimize Y=(A+C).(AD+AD')+AC+C by use of Boolean laws [4 marks]

SECTION B (ANSWER ANY TWO QUESTIONS)

QUESTION TWO (20 MARKS)

a) State two differences between combinational circuits and sequential circuits. [4 marks]

b) Differentiate between a flip-flop and a latch [2 marks]

c) By use of Boolean laws and rules minimize the following Boolean expressions (show your working)

    i. Y=A'(A+B) + (B+AA)(A+B') [4 marks]

    ii. Y=A'+AB [4 marks]

d) Use NAND gate only to realize the following basic gates

    i. OR gate [3 marks]

    ii. AND gate [3 marks]

QUESTION THREE (20 MARKS)

a) Differentiate between SOP and POS [4 marks]

b) Consider the function below

$$F(A,B,C) = {}^{\varepsilon}m\left(2,4,5,6,7\right)$$

    i. Classify the above equation to either SOP or POS form and state why it belongs to that specific form [2 marks]

    ii. Construct the truth table for the equation [4 marks]

    iii. Draw the K-map of the equation [2 marks]

    iv. Minimize the equation using K-map [4 marks]

c) Use only NOR gates to realize AND gate (show your working) [4 marks]

QUESTION FOUR (20 MARKS)

a) Use the circuit below to answer the following questions
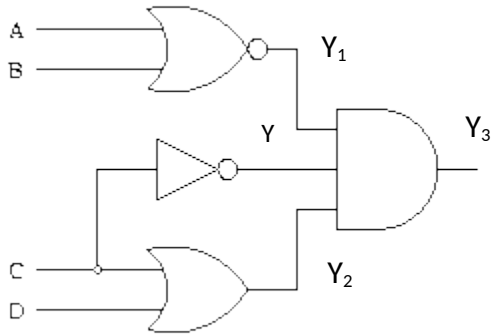
Derive the equation at:

Y   [2 marks]

Y_1 [2 marks]

Y_2 [2 marks]

Y_3 [2 marks]

b) Discuss half adder illustrating its working, diagram and truth table   [8 marks]

c) Discuss two types of ROM memory   [4 marks]

QUESTION FIVE (20 MARKS)

a) Differentiate between SRAM and DRAM   [4 marks]

b) Proof A+A'B == A+B by use of

    i.   Boolean laws and rules   [6 marks]

    ii.   Truth tables   [4 marks]

c) Discuss the Boolean rules under the AND law   [4 marks]

d) Discuss two clock triggering mechanisms   [2 marks]