

UNIVERSITY EXAMINATIONS
SECOND YEAR EXAMINATION FOR THE AWARD OF
DIPLOMA IN COMPUTER SCIENCE
COSC 0211: DIGITAL ELECTRONICS

STREAMS: DIP COMP SCI Y1S1
HOURS

TIME: 2

CAMPUSES: MAIN CAMPUS & EMBU CAMPUS

DAY/DATE:..... **.....**

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 [4marks]
- b) Draw a logic circuit and truth table for $A + BC + C'$. [4marks]
- c) Explain the De-Morgan Boolean law [2marks]
- d) Derive the truth table for a two input NOR gate [2marks]
- e) Sketch the standard symbols of the following basic logic gates and derive their truth tables.
 - i. OR gate [2marks]
 - ii. AND gate [2marks]
- 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. [4marks]
- g) Explain why NOR and NAND gate are referred to as universal gate [2marks]
- h) Differentiate between RAM and ROM as used in memory [4marks]
- i) Minimize $Y=(A+C).(AD+AD')+AC+C$ by use of Boolean laws [4marks]

SECTION B (Answer any TWO questions)

QUESTION TWO (20 marks)

- a) State two differences between combinational circuits and sequential circuits. [4marks]
- b) Differentiate between a flip-flop and a latch [2marks]
- c) By use of Boolean laws and rules minimize the following Boolean expressions (show your working)

- i. $Y=A'(A+B) + (B+AA)(A+B')$ [4marks]
 - ii. $Y=A'+AB$ [4marks]
- d) Use NAND gate only to realize the following basic gates
- i. OR gate [3marks]
 - ii. AND gate [3marks]

QUESTION THREE (20 marks)

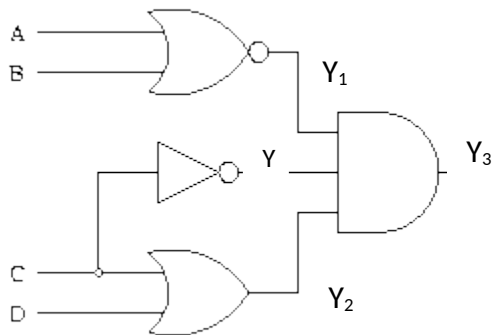
- a) Differentiate between SOP and POS [4marks]
- b) Consider the function below

$$F(A,B,C) = \sum m(2,4,5,6,7)$$

- i. Classify the above equation to either SOP or POS form and state why it belongs to that specific form [2marks]
 - ii. Construct the truth table for the equation [4marks]
 - iii. Draw the K-map of the equation [2marks]
 - iv. Minimize the equation using K-map [4marks]
- c) Use only NOR gates to realize AND gate (show your working) [4marks]

QUESTION FOUR (20 marks)

- a) Use the circuit below to answer the following questions



Derive the equation at:

- Y [2marks]
 - Y_1 [2marks]
 - Y_2 [2marks]
 - Y_3 [2marks]
- b) Discuss half adder illustrating its working, diagram and truth table [8marks]
 - c) Discuss two types of ROM memory [4marks]

QUESTION FIVE (20 marks)

- a) Differentiate between SRAM and DRAM [4marks]
- b) Proof $A+A'B == A+B$ by use of

- i. Boolean laws and rules [6marks]
- ii. Truth tables [4marks]

- c) Discuss the Boolean rules under the AND law [4marks]
- d) Discuss two clock triggering mechanisms [2marks]