CHUKA  UNIVERSITY

UNIVERSITY EXAMINATIONS
THARAKA CAMPUS

SECOND YEAR EXAMINATION FOR THE AWARD OF CERTIFICATE IN COMPUTER SCIENCE

COMP 00108: INTRODUCTION TO DIGITAL LOGIC AND DATA COMMUNICATION

STREAMS: CERT COMP SCI Y1S2 **TIME: 2 HOURS**

DAY/DATE: TUESDAY 3/12/2019 **11.30 A.M – 1.30 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.

QUESTION ONE (30 Marks)

a. Using diagrams, briefly describe the THREE main data communication modes. (6 Marks)

b. Describe the operation of the following gates while illustrating their symbols and the truth table.

a.i. AND gate (2 marks)
a.ii. NOT gate (2 marks)
a.iii. OR gate (2 marks)
a.iv. XOR gate (2 marks)

c. Distinguish between combinational and sequential circuits (4 marks)

d. State two properties shared by all types of flip-flops (4 Marks)

e. State and explain two types of parity checking in error detection (4 Marks)

f. With the aid of diagrams, explain the operation of each type in **e)** above (4 Marks)

SECTION B (ANSWER ANY TWO QUESTIONS)

QUESTION TWO (20 MARKS)

a. Using well -labelled diagrams, explain the function of each of the following circuits:

a.i. Decoder (5 Marks)

a.ii. Multiplexer (5 Marks)

b. Draw a truth table and the logic gate implementation of the Boolean equation below:

(10 Marks)

$$F + \overline{A}B\overline{C} + \overline{A}BC + AB\overline{C}$$

QUESTION THREE (20 MARKS)

a. Illustrate the operation of each of the following flip-flops using their graphical symbols and truth tables:

a.i.i. S-R Flipflop (3 Marks)

a.i.ii. J-K Flipflop (3 Marks)

a.i.iii. D Flipflop (3 Marks)

b. Briefly describe the operation of a ripple counter. (5 Marks)

c. Draw each of the following for the ripple counter described in (b) above:

a.i.i. Sequential Circuit (3 Marks)

a.i.ii. Timing Diagram (3 Marks)

QUESTION FOUR (20 Marks)

a. Using NAND gates only, draw a logic gate implementation to realize the AND gate, OR gate and NOT Gate. (6 Marks)

b. Using NOR gates only, draw a logic gate implementation to realize the AND gate, OR gate and NOT Gate. (6 Marks)

c. Construct a truth table and draw the logic gate diagram for the following Boolean expressions:

i. $ABC + \overline{A}\,\overline{B}\,\overline{C}$ (4 Marks)

ii. $ABC + A\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B}\,\overline{C}$ (4 Marks)

QUESTION FIVE (20 Marks)

a. Discuss the evolution of computers in terms of generations, stating and describing the technology used within each generation. (12 Marks)

b. Briefly discuss each of the following as relates to error detection and correction (8 Marks)

a.i. Cyclic Redundancy Check

a.ii. Checksum
