

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN COMPUTER SCIENCE

COSC 0211: DIGITAL ELECTRONICS

STREAMS: DIP. COMP. SCI (Y2S1)

TIME: 2 HOURS

DAY/DATE: TUESDAY 05/08/2025

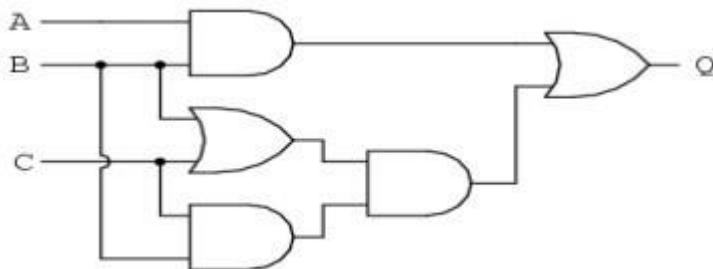
8.30 A.M. – 10.30 A.M.

INSTRUCTIONS:

SECTION A: COMPULSORY

QUESTION ONE (30 MARKS) COMPULSORY

a) Below is a circuit diagram use it to answer the question below



- i. Deduce the output Q in SOP form (4 marks)
- b) Discuss the working of a 4:1 MUX (4 marks)
- c) With the aid of a diagram, discuss **TWO** clock triggering mechanisms as used in sequential circuits (4 marks)
- d) State **FOUR** differences between computer RAM and ROM (4 marks)
- e) Discuss **TWO** Boolean laws that can use to minimize a Boolean expression (4 marks)
- f) Deduce the truth table of the following expression

$$X = \overline{A}\overline{B} + A\overline{B}C + B\overline{C}$$
(3 marks)
- g) Use K-map to minimize the logic expression below (4 marks)

$$F(A,B,C) = \sum m(0,2,4,5,6,7)$$

- h) State **THREE** differences between combinational and sequential circuits (3 marks)

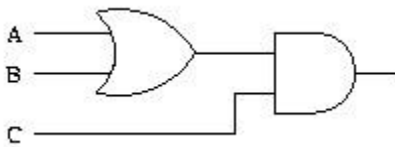
SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 MARKS)

- a) Using a circuit diagram and a truth table, explain the operation of a NOR S-R Latch (8 marks)
- b) Prove that $B' + BC = B' + C$ using
- Boolean Algebra laws (4 marks)
 - Truth table (4 marks)
- c) Explain the **TWO** types of sequential circuits (4 marks)

QUESTION THREE (20 MARKS)

- a) Using a diagram, explain the memory hierarchy of a digital computer (6 marks)
- b) Realize the circuit below using NOR gates only (6 marks)



- c) Explain why it is important to minimize Boolean expressions in digital logic (2 marks)
- d) Use Boolean laws and rules to minimize the logic expression below, then deduce the truth table of the minimized expression (6 marks)

$$\overline{(\overline{A}\overline{B} + \overline{A}B)}(A + B)$$

QUESTION FOUR (20 MARKS)

- a) With the help of a circuit diagram and a truth table, explain the working of an 8 to 3 encoder (8 marks)
- b) Below is a truth table of a combination circuit with 3-inputs A, B, C and two outputs X and Y, use it to answer the following questions.

Inputs			outputs	
A	B	C	X	Y
0	0	0	1	1
0	0	1	0	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	1
1	0	1	0	0
1	1	0	0	0
1	1	1	0	1

- i. Deduce the Boolean expression of output X in POS form 3 marks
- ii. Deduce the Boolean expression of output Y in SOP form 2 marks
- iii. Use K-map to minimize the POS equation in (i) above 5 marks

QUESTION FIVE (20 MARKS)

- a) With the aid of a circuit diagram and a truth table, explain how a half adder works. (6 marks)
- b) Realize a half adder using NAND gates only (6 marks)
- c) Differentiate between a flip flop and a latch (2 marks)
- d) Discuss **THREE** types of Read Only Memory (6 marks)

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