

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

RESIT/SPECIAL EXAMINATION

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE
IN COMPUTER SCIENCE**

COSC 211: DIGITAL ELECTRONICS

STREAMS: BSC (COMP SCI)

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 03/02/2021

8.30 A.M – 10.30 A.M.

INSTRUCTIONS

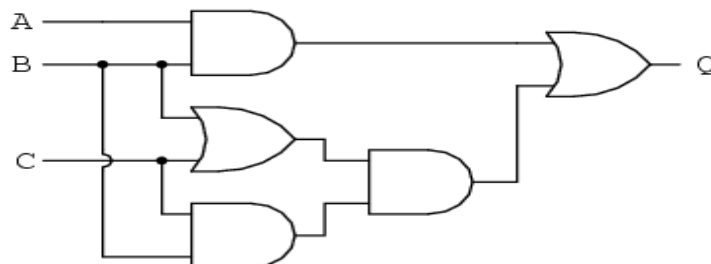
- Answer **all questions** in section A and any other **two questions** from section B.
- No Reference Material is allowed in the exam Room.
- All Mobile phones should be switched off in the exam room.

SECTION A (COMPULSORY)

QUESTION 1(COMPULSORY) [30 MARKS]

a) Using a circuit diagram, explain the operation of an SR flip flop (6 marks)

b) Below is a digital circuit. Use it to answer the question below: -



Draw the minimised product of sum of the above circuit (show the process of conversion from SOP to POS) (6 marks)

c) Using a diagram explain the memory hierarchy of a digital computer (5 marks)

d) Convert 6 decimal to a Binary number, then write the Gray number equivalent of the same. (4 marks)

- e) Explain the four basic movement of data through a shift register (4 marks)
- f) A certain digital device could count number 1 up to 8 in binary numbers. Draw a minimized circuit which will enable this to device give output of logic 1, only where there are two consecutive ones. i.e. 011, 110 etc. (5 marks)

SECTION B (Answer two question from this section)

QUESTION 2 [20 MARKS]

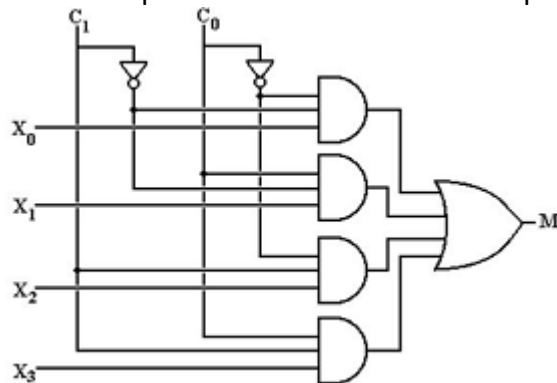
- a) Prove that $(A + B)(\bar{A} + C) = AC + \bar{A}B$ using
 - i) Boolean Algebra laws (4 marks)
 - ii) Truth table (4 marks)
- b) Below is a truth table of a combination circuit with 3-inputs w, x, y, and 2-outputs a, b.

w	x	y	a	b
0	0	0	0	1
0	0	1	0	1
0	1	0	1	1
0	1	1	1	0
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	0

- i) Draw the un-minimized SOP circuit of the above truth table (4 marks)
- ii) Minimize the above SOP circuit (6 marks)
- iii) Draw the minimized SOP circuit (2 marks)

QUESTION 3 [20 MARKS]

a) Below is a circuit of a 4 to 1 multiplexer. Use it to answer the questions below.



- i) Draw the truth table of the circuit (4marks)
- ii) Draw a waveform of the circuit above (4marks)

- b) Distinguish between sequential access and direct access methods of storage devices (4 marks)
- c) Using a Boolean logic example in each case, explain the following laws: -
 - i) Dominance (2 marks)
 - ii) Commutative (2 marks)
 - iii) Idempotent (2 marks)
 - iv) involution (2 marks)

QUESTION 4 [20 MARKS]

- a) With regard to the following POS logic algebra.

$$Y = (A+B) (A+\bar{B}+C) (\bar{B}+C)$$
 - i) Minimize the logic using Karnaugh map POS (4 marks)
 - ii) Minimize the logic using Boolean algebra (leave your answer as POS) (3 marks)
 - iii) Draw the resultant minimised SOP circuit (show workings) (4 marks)
- b) Explain five characteristics of a shift register (5 marks)
- c) Outline FOUR differences between computer RAM and ROM (4 marks)

QUESTION 5 [20 MARKS]

- a) Using the help of a truth table, explain how a half adder works (6 marks)
 - b) Explain three types of computer RAM (6 marks)
 - c) With the help of a circuit diagram, explain the working principles of a Serial-in to Parallel-out shift register. (8 marks)
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