



Where Leaders are Made
UNIVERSITY EXAMINATIONS: 2025/2026

**END OF SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN INFORMATION TECHNOLOGY**

BSIT 101

DIGITAL ELECTRONICS

EXAM DATE: MONDAY 15TH DECEMBER 2025 TIME: 5:00PM-7:00PM

DURATION: 2 HOURS

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

SECTION A (COMPULSORY)

QUESTION ONE (15 marks)

- a) Describe three Number systems popularly used in computer systems and digital systems. (3 marks)
- b) Discuss two important of the truth table of logic gates (2 Marks)
- c) Convert the following binary numbers, into Decimal Number. (3 marks)
11001101.10101012 *Show all the working.*
- d) Discuss the following terms as used in digital logics. (4 marks)
 - i. A.D.C.
 - ii. Encoders
- e) Based on the NAND gate diagram below, build a 3 input truth table (3 Marks)



Exhibit 2.2: NAND

SECTION B: (ANSWER ANY THREE (3) QUESTIONS IN THIS SECTION)

QUESTION TWO (15 Marks)

- a) Design, from the first principle, a four inputs logic circuit, such that the output will be high, only if three or more inputs are high. Simplify the logic circuit derived and

implement the design.

(7 Marks)

b) Evaluate the following calculations/numbers Conversions, into the indicated formats.

NB: Show all the workings.

(4 Marks)

i. 1010101011001100bin into hexadecimal number.

ii. 1101010100bin into decimal number.

c) The propagation delay of a single 2-input NAND gate is 5 ns. What is the total worst-case propagation delay of a 4-bit ripple-carry adder built using these gates in its full-adder cells? Justify your answer. (4 marks)

QUESTION THREE (15 Marks)

a) Below is an XOR gate Table, represent the inputs in a logic XOR gate circuit (5 Marks)

A	B	$\oplus$
0	0	0
0	1	1
1	0	1
1	1	0

Table 4: XOR table

b) Flip-flops are commonly used in digital circuits, discuss its application (2 marks)

c) Simplify the Boolean function below, using any technique of your choice. (4 marks)

$$Y = \bar{A}BC + A\bar{B}\bar{C} + \bar{A}BC + A\bar{B}C + ABC$$

d) Using De Morgan's Theorems, prove that a NAND gate is equivalent to a NOT-OR gate (i.e.,

an OR gate with inverted inputs). Show the algebraic transformation and draw the equivalent

logic circuits.

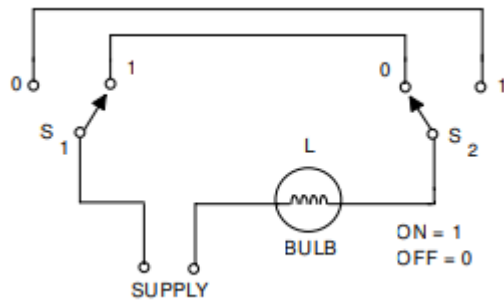
(4 marks)

QUESTION FOUR (15 Marks)

a) Boolean algebra is commonly used in digital electronics. State the Laws & Rules. (4 marks)

b) Explain three application areas of digital circuits. (3 Marks)

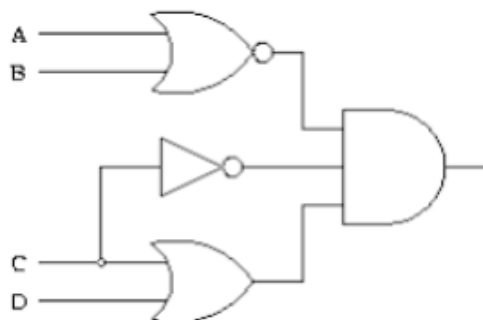
c) A staircase light is controlled by two switches one at the top of the stairs and another at the bottom of stairs as shown below;



- i) Write the logic equation in SOP form. (3 marks)
- ii) Tabulate a truth table for this system. (5 marks)

QUESTION FIVE (15 Marks)

- a) Discuss the code where all successive numbers differ from their preceding number by a single bit. (3 marks)
- b) Perform the following number conversions
 - (i) (13A7)₁₆ to decimal
 - (ii) (3F2)₁₆ to binary (4 marks)
- c) Express the circuit below as a Boolean function. (4 Marks)



- d) Describe FOUR Number systems popularly used in computer systems and digital systems. (4 Marks)

QUESTION SIX (15 marks)

- a) Define the term flip-flop. (3 marks)
- b) Draw the truth table of a J-K flip-flop with active high inputs. (4 marks)
- c) (i) With the aid of a logic circuit and a truth table, explain the operation of an R-S flip-flop (4 marks)
- (ii) Discuss two limitations of the R-S flip-flop (4 marks)