UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

SUPPLEMENTARY/SPECIAL EXAMINATION
YEAR ONE SEMESTER TWO
FOR THE DEGREE
(INFORMATION TECHNOLOGY)

COURSE CODE   :   **BIT 124**

COURSE TITLE   :   **DIGITAL ELECTRONICS**

DATE: 10/08/2023   TIME: 08.00A.M. - 10.00A.M.   2HRS

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY)[30 MARKS]

a. Define the term digital system hence give one example of such a system. **[3 marks]**

b. What is a Logic gate? **[2 marks]**

c. Draw a truth table and a logic diagram that implements the following function.

$T(\bar{S}+P)$ **[6 marks]**

d. Define a combination logic circuit by outlining its three major attributes. **[3 marks]**

e. What is propagation delay? **[2 marks]**

f. What is the binary equivalent of the decimal number 368 **[3 marks]**

g. Prove that $ABC + ABC' + AB'C + A'BC = AB + AC + BC$ **[3 marks]**

h. What is a sequential logic circuit? **[2 marks]**

i. What is a flip flop? **[2 marks]**

j. Define the term edge-triggering. **[2 marks]**

k. Contrast between latch and flip-flop. **[2 marks]**

QUESTION TWO [20 MARKS]

a. A computing system performs its calculations based on Boolean algebra. Explain step by step how the computer performs the calculation (45-20) **[5 marks]**

b. Simplify $A + BC$ to its Standard Sum of products hence find its min-terms **[5 marks]**

c. Minimize the logic function $F(A,B,C,D) = \sum m(1,3,4,5,6,7,9,12,13)$ using Karnaugh map method. **[5 marks]**

d. Explain the operation of a BCD to seven segment display hence illustrate its truth table. **[5 marks]**

QUESTION THREE [20 MARKS]

a. Draw a JK flip flop and its characteristic table **[2 marks]**

b. Outline any four applications of flip flops. **[4 marks]**

c. Describe the two basic operations of a state machine. **[4 marks]**

d. Draw the symbol of an Exclusive-NOR gate and its truth table. **[4 marks]**

e. With the help of a diagram, state and illustrate the three main ways of specifying the function of a combinational logic circuit. [6 marks]

QUESTION FOUR [20 MARKS]

a. Generate an AND function using a NAND gate topology. [2 marks]

b. With the help of a diagram, explain how propagation delay is experienced in a ripple counter. [6 marks]

c. Design a 3-bit binary up counter [12 marks]

QUESTION FIVE [20 MARKS]

a. Describe two types of propagation delay. [4 marks]

b. Describe fan-in and fan-out with respect to logic families [4 marks]

c. Using logic gates, design a decoder with three input lines and only six output lines. [12 marks]