



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**University Village, 91 Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja**  
**FACULTY OF SCIENCES**  
**COMPUTER SCIENCE DEPARTMENT**  
**2020 EXAMINATIONS**

**CIT 344 – Introduction to Computer Design**                      **Credit: 3 units**

**TIME ALLOWED:** 2½ Hours

**INSTRUCTION:** Answer Question 1 and any other FOUR (4) Questions

**QUESTION ONE**                      **(22 marks)**

- (a) i. Carry out the binary division of 1011 by 11                      **(1 mark)**  
ii. Convert decimal number 10 to its binary equivalent                      **(1 mark)**  
iii. Convert the binary number  $10101_2$  to its decimal equivalent                      **(1 mark)**  
iv. Explain Sum-of-Weights method of number conversion                      **(1 mark)**  
v. Convert 22 in base 8 into its decimal equivalent.                      **(1 mark)**  
vi. Calculate the octal subtraction of  $(232)_8$  from  $(417)_8$                       **(1 mark)**
- (b) Distinguish between Combinational and Sequential Logic                      **(4 marks)**
- (c) i. Construct the Truth-Table for NAND based S-R Latch                      **(2 marks)**  
ii. Draw the logic gates for NOR Based S-R Latch                      **(2 marks)**
- (d) What is a Register?                      **(1 mark)**
- (e) What is a Finite State Machine?                      **(1 mark)**
- (f) Explain different types of Random Access Memory (RAM)                      **(2 marks)**
- (g) What is pipelining?                      **(1 mark)**
- (h) Mention any THREE Microprocessor Components                      **(3 marks)**

**QUESTION TWO**                      **(12 marks)**

- (a) Distinguish between Half Adder and Full Adder.                      **(4 marks)**
- (b) Given a 1-bit Half Adder:
  - i. Draw the Truth Table                      **(1 mark)**
  - ii. Draw Karnaugh Map for Sum                      **(1 mark)**
  - iii. Simplify the Sum-of-Product (SOP) for the output Sum                      **(1 mark)**
  - iv. Draw Karnaugh Map for Carry                      **(1 mark)**
  - v. Simplify the Sum-of-Product (SOP) for the output Carry                      **(1 mark)**
  - vi. Draw Logic Circuit                      **(3 marks)**

**QUESTION THREE**

(12 marks)

(a). Using the truth table for 7 Segment LED Decoder given below with 4 inputs A, B, C, D and 7 outputs a, b, c, d, e, f, g to answer the following questions.

**Truth Table**

| A | B | C | D | a | b | c | d | e | f | g |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |

- i. Write out the Boolean function for the expression of **a** (2 marks)
- ii. Draw the K-Map for **a** (4 marks)
- iii. Simplify the expression obtained from **a** through the K-map (2 marks)

(b) Evaluate this expression  $(P \vee \neg Q) \wedge \neg(P \wedge Q)$  using Truth Table (2½ marks)

(c) What is a Demultiplexer? (1½ marks)

**QUESTION FOUR**

- (a). Construct the truth –Table for Sequence of States of a 4-Bit Johnson Counter (5 marks)
- (b) Mention and explain two applications of Shift Registers (3 marks)
- (c) Distinguish between encoder and decoder (4 marks)

**QUESTION FIVE**

(12 marks)

(a) Given the expression for the SOP where output  $Z = \bar{a}bc + a\bar{b}c + ab\bar{c} + abc$

- i. Draw the Karnaugh Maps (4 marks)
- ii. Simplify the expression (1 marks)
- iii. Draw the logic gates (4 marks)
- (b) Explain the term Bus (1 mark)
- (c) Explain the term Polling (2 marks)

**QUESTION SIX**

(12 marks)

- (a). Construct the Truth-table for a 3-to-8 decoder with enable (5 marks)
- (b) List and explain the various applications of Decoders (3 marks)
- (c) Draw the block diagram for Sequential Circuit (2 marks)
- (d) Explain Synchronous and Asynchronous sequential circuits (2 marks)