



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)