NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, 91 Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja
FACULTY OF SCIENCES
COMPUTER SCIENCE DEPARTMENT ₁₂₄
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∨¬Q) ∧ ¬(P∧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**)