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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR FIRST YEAR, SECOND SEMESTER EXAMINATION FOR THE BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY <u>KIT 2109 DIGITAL ELECTRONICS & LOGIC</u>

Date: 14TH AUGUST 2024 Time: 11:30AM – 1:30PM

<u>INSTRUCTIONS TO CANDIDATES</u> <u>ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS</u> <u>QUESTION ONE (30 MARKS)</u>

a)	Given the two binary numbers $X = 1010100$ and $Y = 1000011$, perform the following subtraction using 2's complement:	
	i) $X - Y$	(3 Marks)
	ii) $Y - X$	(3 Marks)
b)	With examples, differentiate between Synchronous and Asynchronous sequential circuit	s.
,		(4 Marks)
c)	Define the term Digital System.	(2 Marks)
d)	Showing your workings, Obtain a minimized expression from the following Boolean exp	pressions
	using Kmap.	L
	$F(A,B,C) = \sum m(1,3,4,6,7)$	(4 Marks)
e)	Describe any THREE common Logic operations (Logic Gates) in Boolean algebra givin	g their
<i>,</i>	symbols and truth tables.	(3 Marks)
f)	Differentiate a flip flop from a Latch	(4 Marks)
g)	Prove that $A + \overline{A}B = A + B$.	(5 Marks)
h)	Draw the logical design of Half Adder	(2 Marks)
<u>QU</u> a) b)	ESTION TWO (20 MARKS) Flip-flops are memory elements used in clocked sequential circuits. Discuss the Clocked using an illustration and truth table Convert 2EE ₁₆ to binary.	l RS flip-flop (8 Marks) (4 Marks)
c)	Develop a truth table for the expression $\overline{A} \ \overline{B} + A \overline{B} \ \overline{C} + ABC$.	(6 Marks)
d)	Define the following term:	
	i) Logic gates	(2 Marks)
<u>QU</u> a) b)	ESTION THREE (20 MARKS) Reduce A'B'C' + A'BC' + A'BC Using binary arithmetic, do the following calculations	(7 Marks)
	i) $10101010 - 10100010$	(2 Marks)
	ii) $11010 \div 101$	(2 Marks)
		(
c)	Using Boolean laws of algebra show that:	(5 Marks)
	A + B.C = (A + B).(A + C)	

d) The figure below shows an arrangement of logical gates. Construct a truth table showing the outputs X, Y and Z
 (4 Marks)



QUESTION FOUR (20 MARKS)

a) Show that AB + (AC)' + AB'C(AB + C) = 1

(8 Marks)

- b) Reduce the expression (A B C)C+ A B C + D using DeMorgan's theorem and Boolean algebra and draw the logic diagram of the simplified expression. (6 Marks)
 c) Represent the following expression using K-map (6 Marks)
- c) Represent the following expression using K-map $F(A,B,C,D) = \Pi m (1,2,3,5,7,8,12,14)$

QUESTION FIVE (20 MARKS)

- a) Given the two binary numbers X = 1010100 and Y = 1000011, perform the following subtraction using 1's complement: (6 Marks)
 - i) X Y
 - ii) Y-X
- b) Showing your workings, reduce A(A + B)
- c) Discuss the clocked J.K flip flop using a diagram

(6 Marks) (8 Marks)