

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

COMPUTER SCIENCE

DIGITAL LOGICS

TIME: 2HRS

Q1

- a) Determine the binary equivalent of the decimal number 368(3mks)
- b) Use logic gates to realize the Boolean expression
 $Y = ABCD + \bar{A} \bar{C}$
(3mks)
- c) Simplify the Boolean expression
 $\bar{A}.B + A.\bar{B} + AB$ (4mks)
- d) Realize the D flip-flop using the RS flip-flop(7mks)
- e) What is a register? Give two examples of registers and one application in the field of computing(4mks)
- f) Complete the following table of equivalent values (9mks)

Binary	Octal	Decimal	Hexadecimal
		11.1875	
11101.11111101			
			1B.4C

Q2

- a) Obtain the two's complement of the number 1101101 (3mks)
- b) Simplify algebraically:
 $x = BC + (\bar{A} + \bar{B})(A + C)$ (4mks)
- c) Implement the following using NOR gates only
 $X = (A + B)(B + C)(A + C)$ (4mks)
- d) A combinational circuit has 3 inputs A, B, C and output F. F is true for the following input combinations:
 - A is false, B is true

- A is false, C is true
- A, B, C are false
- A, B, C are true

i) Write the truth table for F (3mks)

ii) Draw the Karnaugh map and simplify the expression (3mks)

iii) Draw logic circuit diagram (3mks)

Q3

a) Convert the binary number 10110 to gray code(3mks)

b) Implement $x = AB + BC + AC$ using NAND gates only (4mks)

c) With the relevant logic diagram and truth table explain the working of two input EX-OR gate (7mks)

d) Distinguish combinational logic circuits from sequential circuits (2mks)

e) Add 648 and 487 in BCD code (4mks)

Q4

a) Convert the decimal number 430 to excess-3 code (2mks)

b) Convert the decimal number 82.67 to its binary and hexadecimal equivalent(5mks)

c) Design a combinational circuit that converts a 4bit binary number. Implement with exclusive OR gates only. (13mks)

Q5

a) Find the hex sum of $(93)_{16} + (DE)_{16}$ (3mks)

b) Express the function $f(A, B, C) = AB + BC + ABC + AC$ in a Canonical sum of Products form (5mks)

c) Define a counter. Give any two characteristics of counters? (5mks)

d) Realize a JK flip-flop using a D flip-flop(7mks)

