WOMEN'S UNIVERSITY IN AFRICA

Addressing gender disparity and fostering equity in University Education

FACULTY OF MANAGEMENT AND ENTREPRENEURIAL SCIENCES

BSc HONOURS DEGREE IN COMPUTER SCIENCE

MAIN PAPER

HCS 113: LOGIC DESIGN & SWITCHING CIRCUITS

INTAKE 3: FIRST YEAR FIRST SEMESTER

TIME: 2 HOURS AFTERNOON

INSTRUCTIONS TO CANDIDATES

Answer any **four** questions.

QUESTION 1

Design an 8 bit register. [25]

QUESTION 2

Using Boolean algebra rules, do the following

a) Simplify the following logic expression [10]

$$f = AB + A\bar{C} + C + AD + A\bar{B}C + ABC$$

b) List out the Basic Theorems and Properties of Boolean Algebra. Justify with Proof. [15]

QUESTION 3

a) Write brief notes on the following
   i. SIPO;
   ii. PIPO;
   iii. SISO; and
   iv. PISO. [8]

b) Draw and explain the block diagram of PLA. [9]

c) Design the following
   i. Half adder; and
   ii. Full adder [8]

QUESTION 4

a) Differentiate between encoder and decoder [6]

b) Differentiate between multiplexer and decoder [6]

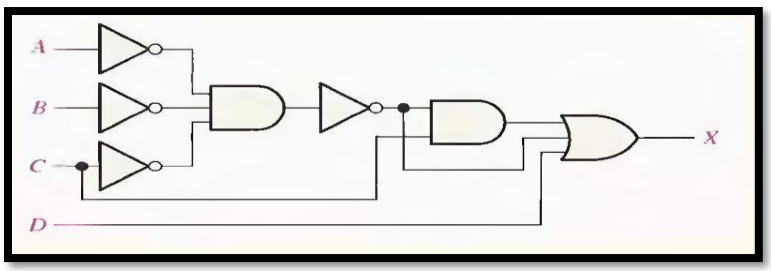
c) Differentiate between Asynchronous Counters and synchronous counters [6]

d) Draw the J-K flip flop and truth table [7]

QUESTION 5

a) What does and EXOR gate do [6]

b) Reduce (Simplify) the logic circuit in to a minimum form. [6]



c) Express the Boolean function

$$D = (\overline{A} + B)(\overline{B} + C)$$

i. As a product of maxterms. [7]
ii. As a sum of minterms. [6]

QUESTION 6

a) Convert the hexadecimal number 4B3 to decimal notation. What about the decimal equivalent of the hexadecimal number 4B3.3? [4]
b) Convert 234.14 expressed in an octal notation to decimal. [4]
c) Consider converting 101102 to base 8 [3]
d) Convert number 11001111 to hexadecimal [3]
e) Use a **K-map** to simplify the Boolean expression

$$E = \overline{A}\,\overline{B}\,\overline{C}D + \overline{A}CD + \overline{A}\,\overline{C} + C$$

[5]

f) Design the function $(\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{D}) = \sum \mathbf{m}\,(\mathbf{1}, \mathbf{4}, \mathbf{5}, \mathbf{8}, \mathbf{10}, \mathbf{12}, \mathbf{13})$ using **8x1 multiplexer**. [6]

END