



Kasarani Campus
Off Thika Road
Tel. 2042692 / 3
P. O. Box 49274, 00100
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2022/2023 ACADEMIC YEAR
SECOND YEAR, SECOND SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE
KCS 206 – DIGITAL LOGIC AND DESIGN

Date: 15TH DECEMBER 2022
Time: 8:30AM – 10:30AM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

- a) Define digital system. (2 Marks)
- b) Give the reason why the computers we use referred to as digital system. (2 Marks)
- c) Describe five characteristics of a digital system. (4 Marks)
- d) Give the difference between digital signal and analog signal (4 Marks)
- e) Convert the following decimal numbers into binary. (6 Marks)
 - i) 0.125
 - ii) 27.750
- f) Find the 2's complement of the following 8bit binary signed numbers (6 Marks)
 - i) 1111 0010
 - ii) 0110 1110
- g) State two minimization techniques employed in minimizing Boolean expressions (2 Marks)
- h) Define full adder and half adder as used in combinational circuits. (4 Marks)

QUESTION TWO (20 MARKS)

- a) The truth table below was developed from a “spec”. Show the SOP expression and then minimize it using a K-map and draw the minimized circuit. (10 Marks)

x	y	z	f
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

- b) A 12-bit system stores the binary number 1000 1011 0011. Convert this into:
 - i) Decimal number (4 Marks)
 - ii) BCD (3 Marks)
 - iii) Hexadecimal number (3 Marks)

QUESTIONS THREE (20 MARKS)

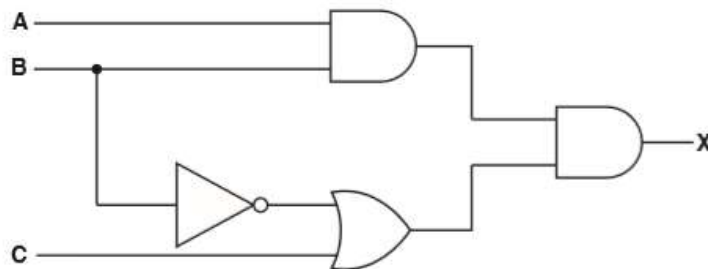
- a) A priority encoder has $2N$ inputs. It produces an N -bit binary output indicating the most significant bit of the input that is TRUE, or 0 if none of the inputs is TRUE. It also produces an output NONE that is TRUE if none of the inputs is TRUE.
- Write down the Truth Table showing all inputs and all outputs for an eight-input priority encoder. (4 Marks)
 - Give simplified Boolean expressions for all outputs of the eight-input priority encoder. (6 Marks)
- b) Inputs **A** and **B** are applied to an **AND** gate. The output of the gate is applied to one input of **OR** gate. Input **C** is applied to the other input of the OR gate. Draw the logic diagram and show the output of the **OR** gate. (4 Marks)
- c) Explain the differences between full adder and half adder. (6 Marks)

QUESTION FOUR (20 MARKS)

- a) Find the 1s complement and 2s complement of each of the following numbers.
- $+56_{10}$ (2 Marks)
 - -23_{10} (2 Marks)
- b) Three pressure sensors each produce a logic 0 output when their pressure at their location falls below a pre-set pressure P_1 , P_2 , or P_3 . A pump is to be turned on whenever the pressure at all three locations falls below the pre-set value. Obtain the Boolean expression describing the required circuit. (6 Marks)
- c) Briefly describe the procedure for designing a combinational logic circuit. (4 Marks)
- d) The major difference among various storage elements are the number of input they possess and the manner in which the inputs affect the binary state. State and explain the two types of storage elements. (6 Marks)

QUESTION FIVE (20 MARKS)

- a) Draw logic diagram to implement the following functions? (8 Marks)
- $F = \overline{(A + B)} + A\overline{C}$
 - $F = (A+B) (A+\overline{B} + \overline{C}) (\overline{B} + D)$
- b) Write a logic function or statement that corresponds with the following logic diagram. (4 Marks)



- c) Describe the differences between combinational circuit and sequential circuits. (8 Marks)