



CRAWFORD UNIVERSITY.

FAITH CITY, IGBESA, OGUN STATE

COLLEGE OF NATURAL AND APPLIED SCIENCES

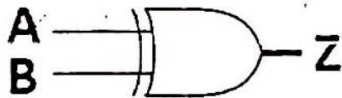
B.Sc. EXAMINATION RAIN SEMESSTER 2017/2018 SESSION

CSC202: LOGIC DESIGNS AND COMPUTER HARDWARE

TIME ALLOWED: 2 HOURS

INSTRUCTIONS: Answer 4 Questions only

1(a) what is a universal logic gate? Mention one logic gate you know to be universal. State any 3 reasons why universal logic gates are very important in logic design and computer hardware (5 mks).



1 (b) Name the logic gate whose symbol is shown above and draw the truth table for it. (3mks)

ii. From the truth table derive a Boolean expression that this gate can implement. (2 Mks)

iii..State two applications of this logic gate in mathematical circuits and devices. (2mks)

1 (c) what are the characteristics of basic logic gates? (3 Mks)

2 (a) A certain full adder takes three binary inputs A, B, C and produces two binary outputs S and Cout. If S is the sum of the three inputs while Cout is the carry bit:

- Draw up a truth table for this adder using A, B, C as inputs, and S and Cout as outputs.(3 mk)
- From the truth table, derive two Boolean expressions; one for S and another for Cout (4mks)
- Minimize the two functions using any method you know. (4 mks)
- From the result of the minimization, draw the implementation of the two functions. (4 MKS)

3(a) Evaluate the following Boolean expressions (10 mks)

- $1+0$
- $X.X$
- $X.1$
- $X.0$
- $X+X$
- $X+0$
- $X+1$
- $X.X'$
- $X+X'$
- $(X')'$

3(b) In the Boolean expression:

$$ABC + ABC' + AB'C + AB'C' + A'B'C$$

- How many variables are there? List them (2 mks)
- How many literals? List them (3 mks)

4(a) Consider the Boolean expressions:

- $(A+B')(A+C)$
- $AB + BC + AC$
- $A'B'C + A'BC' + AB'C' + ABC$

- For each expression, decide if it is a sum of products. (2mks)
- For each expression, decide if it is a **standard** sum of products. (2mks)
- For the first expression derive the **standard** sum of products. (2 mks)

4(b) Consider the expressions:

$$A + (BC)'$$
$$A + B'C'$$

- Draw the logic circuit for the two expressions. Two circuits are needed. (4 mks)
- Draw the truth tables for the two expressions. Two tables are required. (4 mks)
- From the truth tables, determine if the expressions are equivalent. (1 mk)

5(a) it is known that:

$$A(B+C) = AB + AC. \text{ And } A(A' + B) = AB$$

Using the duality principle or otherwise, derive the expressions for

- $A + BC$ (2mks)
- $A + A'B$ (2 mks)

5(b) Draw and fully label a Karnaugh map for three variables A, B, C. (3 mks)

5(c) Use the Karnaugh map of question 5(b) to minimize the following

- $ABC + ABC'$ (2 mks)
- $A'BC + AB'C + ABC' + ABC$ (3 Mks)
- $A'BC + A'B'C + A'BC' + A'B'C'$ (3 Mks)

6(a) write a short note on each of the following digital devices taking care to mention what the device does, the number of inputs, number of outputs and any other variables the device requires. The circuit symbols, truth tables and circuit implementations are **not** required.

- Encoder (3 mks)
- Decoder (3 mks)
- Multiplexer (3 mks)
- Demultiplexer (3 mks)

6(b) what is a code? State the BCD code for 512. (3 mks)

END