COURSE CODE: CSC 2205   **TIME DURATION: 2hours**
COURSE TITLE: DIGITAL LOGIC AND DESIGN
INSTRUCTION: Answer four questions only

QUESTION ONE

a. By letting diodes perform the logical AND or OR function and then amplifying the result with a transistor, we can avoid some of the limitations of resistor-transistor logic (RTL). State limitations of RTL.

b. Give one advantage and two disadvantages of diode logic (DL).

c. Fill in the blank spaces from I to VI.

i. The additive inverse defines _____

ii. The binary operator (**.**) defines _____

iii. The binary operator (+) defines _____

iv. The multiplicative inverse of $\alpha = 1/\alpha$ defines _____

v. The multiplicative identity is _____

vi. The additive identity is _____

d. Answer true or false from questions i to iii.

i. A typical logic gate has a FAN-IN of 1 or 2.

ii. A typical transistor-transistor logic (TTL) gate has a fan-out of 10.

iii. Diode logic (DL) cannot performs a **NOT** function.

iv. The annulment law states that A term AND ed with a "0" equals 0 or OR ed with a "0" will equal 1.

v. Two separate terms NAND ed together is not the same as the two terms inverted (Complement) and OR ed.

ei. What is another name for EMITTER-COUPLED LOGIC (ECL)?

eii. What is the full meaning of the abbreviation – CMOS.

f. Complete the table below representing the Boolean algebra for XOR operation.

A $\oplus$ 0 =
A $\oplus$ 1 =

QUESTION TWO

a. Using the laws of Boolean algebra and deMorgan's law, simplify the following expressions.

i. $Q = (A + B)(A + C)$

ii. $Z = \overline{A + B + C}$

iii. $Q = \overline{A + B} + AB$

iv. $S = \overline{A + B + C} + \overline{AB} + \overline{BC}$

vi. $F = \overline{AB + (B + C)} + \underline{D}$

NOTE: FOR EACH STEP IN SIMPLIFYING THE EXPRESSION, STATE THE LAW THAT APPLIES.

b.   Write the Boolean expression for the logic circuit below.
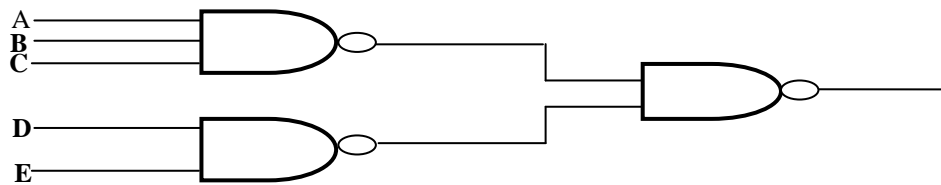
QUESTION THREE

a.   **FILL THE TRUTH TABLE BELOW**

X	Y	Z	X.Y.Z	(X + Y + Z)	X $\oplus$ Y	Y $\oplus$ Z	X $\oplus$ Z
0	0	0					
0	0	1					
1	0	1					
1	1	0					
1	1	1					

b.   What is are logic gates?

c.   State deMorgan's theorem.

QUESTION FOUR (a)

i.   Covert $9E.AF2_{16}$ into an equivalent binary number.

ii.   Convert 362.35_8 into a decimal number.

iii.   Convert 25.625_{10} into a binary number.

iv.   Convert 11010110_2 into an equivalent hexadecimal number.

v.   Convert $29C_{16}$ into an equivalent binary number.

b.   Given a subtraction problem on a decimal number: 58032-59. Find the difference using the method of complements.

c.   Subtract the given hex number. 5DC – 3AF

d.   Using Binary Coded Decimal, add the given numbers. 24 + 48.

QUESTION FIVE

a.   Express the Boolean function F = A + B'C as standard sum of minterms.

b.   Write a short note on the following: canonical form, sum of minterm, product of maxterm microprocessor and standard form.

c.   Express the Boolean function F = xy + x'z as a product of maxterms

QUESTION SIX

a.   Draw a truth table representing minterm and maxterm.

b.   Convert Boolean expression in standard form F=y'+xz'+xyz

c.   Expand the following expression and discard the redundant term

(A+B'+0) (B+C+0) (A+C'+0) (A+B+0) (A+C'+0)

CROSS RIVER UNIVERSITY OF TECHNOLOGY, CALABAR
SECOND SEMESTER EXAMINATION 2017/2018 SESSION
DEPARTMENT OF COMPUTER SCIENCE

COURSE CODE: CSC 2203   **TIME DURATION: 2hours**
COURSE TITLE: INTRODUCTION TO DIGITAL DESIGN
INSTRUCTION: Answer Question One and Any Other 3 Questions

1a.   Draw a circuit diagram for $X = (D + \overline{(A + B)\ C}).E.F.\overline{(A + F)}$

1b.   Evaluate $X = [\overline{(A + B)} + (A + C)].\ \overline{(A + D + C)}$ Given $A = 1$, $B = 0$, $C = 0$ and $D = 1$

1c.   Using a three input function given below, construct the truth table and draw the circuit diagram for it. $F = A\ B + B\ C + A\ C$

2.   Differentiate between; (A) Analog and digital systems in terms of signal, waves, impedance, representation and memory.

2b.   Analog and digital signal.

3.   Using the Boolean laws and deMorgan's law, simplify the following expression:
1. $Q = (A + B)(A + C)$.   2. $F = \overline{A + B + C}$ 3. $F = \overline{A + B} + AB$
4. $F = \overline{A + B + C} + \overline{AB} + \overline{BC}$

4a.   Simplify the function given below stating the laws used in each step
$F(x,y,z) = \bar{x}yz + \bar{X}y\bar{z} + xz$

b.   Write short notes on the following (i) Logic gate (ii) Boolean Algebra

5a.   Design a circuit diagram for a diagram for a two input function given:
$(A + B)\ (A + \bar{B}\ (\bar{A} + B)$

b.   Convert 1010.011_2 into a decimal number.

6a.   Draw the symbols for AND, OR, NOT, XOR, NAND and NOR gates.

b.   Draw a two input value Truth Tables for XOR, NAND and NOR