ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

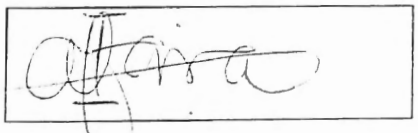
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

SEMESTER II EXAMINATION, 2015/2016 ACADEMIC SESSION

COURSE TITLE: ELECTRONIC CIRCUITS II

COURSE CODE: EEE 322

EXAMINATION DATE: 14TH JULY, 2016



COURSE LECTURER: DR AFARA, I.O.

HOD's SIGNATURE

TIME ALLOWED: 2HRS

INSTRUCTIONS:

1. ANSWER **QUESTION 1**, AND ANY OTHER 2 QUESTIONS **(TOTAL OF 3 QUESTIONS)**
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE ALLOWED TO COME INTO THE EXAMINATION WITH A SINGLE A4 SHEET OF FORMULA (***PRINTED AND NOT HANDWRITTEN***). YOU ARE **NOT** ALLOWED TO SHARE OR DISTRIBUTE FORMULA SHEETS.
4. YOU ARE **NOT** ALLOWED TO BORROW CALCULATORS AND ANY OTHER WRITING MATERIALS DURING THE EXAMINATION.

QUESTION 1 (COMPULSORY): [40%]

(a). Convert the following codes:

i. 321_{10} to BCD_{8421}

ii. 001101110110 BCD_{8421} to decimal.

iii. 0001100101100110 BCD_{8421} to decimal.

(b). Evaluate the following:

i. 01010110 - 00100011

ii. 0111 x 0101

iii. 01111000 / 110

(c). List the different classes of binary codes and give examples of two.

(d). i. Explain how the two types of binary compliments can be obtained.

ii. Evaluate 0011010 – 001100 using the binary compliments method.

QUESTION 2: [30%]

(a). Prove the De Morgan's theorem by *perfect induction* (show the truth table).

(b). Simplify the logic expressions U and V using Boolean algebra:

i. $U = (AB(C + \overline{BD}) + \overline{AB})CD + ABCD$

ii. $V = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C$

(c). Given the following logic expressions:

$$f = \bar{A}B\bar{D} + BCD + \bar{A}B\bar{C}D + CD$$

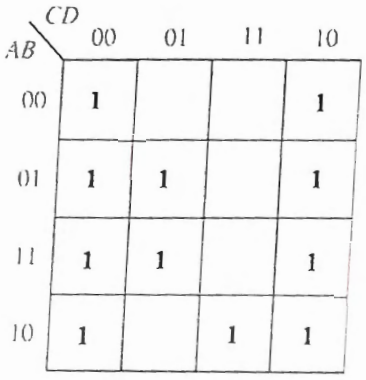
$$g = (\bar{A} + \bar{B} + C + D)(\bar{A} + B + \bar{C} + \bar{D})(A + B + \bar{C} + D)(\bar{A} + \bar{B} + \bar{C} + \bar{D})(A + B + \bar{C} + \bar{D})$$

i. Express f and g in standard form (if necessary),

ii. Minimize the expressions f and g using K-map,

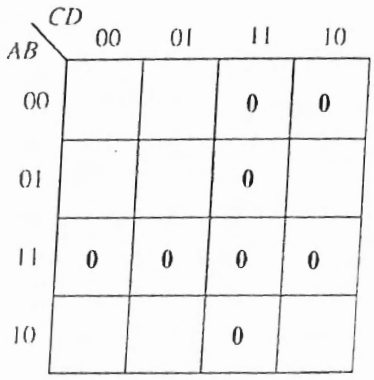
iii. Implement the minimized expressions using AND and OR gates.

(d). Given the following populated Karnaugh maps:



AB \ CD	00	01	11	10
00	1			1
01	1	1		1
11	1	1		1
10	1		1	1

(A)



AB \ CD	00	01	11	10
00			0	0
01			0	
11	0	0	0	0
10			0	

(B)

i. Simplify the logic expression represented on the maps,

ii. Implement the minimized expressions using the basic logic gates.

QUESTION 3: [30%]

(a). What are combinational circuits, mention 3 of their characteristics, and list 6 examples of combinational circuits.

(b). Given the truth table of a full adder (Table 1):

i. Obtain the expression for the carry bit C_o using K-map,

ii. Synthesis the logic circuit for the expression using basic logic gates.

Inputs			Output	
A	B	C_{in}	S	C_o
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Table 1: Truth table of a full adder

(c). i. What are decoders and what are their functions? Give examples of decoders.

ii. Given the truth table of a special decoder (Table 2), obtain expressions for the outputs, and synthesis the logic circuit for the expressions using basic logic gates.

Inputs		Output			
A	B	D_3	D_2	D_1	D_0
0	0	1	0	0	0
0	1	0	1	0	0
0	1	0	0	1	0
1	1	0	0	0	1

Table 2: Truth table of a special decoder

QUESTION 4: [30%]

(a). What are sequential circuits? Mention 3 of their characteristics, and list 2 examples of sequential circuits.

(b). Differentiate, with the aid of diagrams, between synchronous and asynchronous sequential circuits.

(c). What are multivibrators and what are their functions?

(d). Mention the 3 common types of multivibrators and describe their main characteristics and opertion in detail.