CDA 3103 001 **Computer Organization** **Exam #1**

Summer 2016 **Your Name & U#:** 1680 3738 Steven Romeiro

47.5

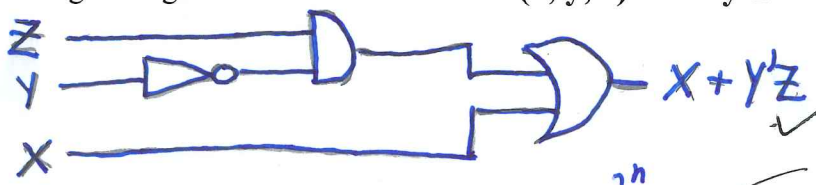
Notes:

- Closed Text and Closed Notes Exam
- Time: 11:00am – 12:15 pm
- There are **5** questions.
- Answer in clear and legible handwriting. Partial credit will be given.
- Exams written in pencil will **NOT** be **re-graded**.
- Write your name/U# on each page of the exam.

I	II	III	IV	V	Total

I. (10 pts) Answer the following questions in no more than ONE LINE. Each question carries one point.

1. What is the difference between Computer Architecture and Computer Organization? (1)
   Computer architecture = deals with structure & behavior of computer system
   Computer Organization = deals with physical aspects & implementation of architectual design
2. 2 GB = (2×2^{20})KB (1) 12/2 = 10
3. $(12.375)_{10}$ = (1100.011)$_2$ (1) 6/2 = 10 ✓
4. Insert a parity bit at the end of given 7 bit data to make it odd parity: **1001100**0 (1) 3/2 = 11 ✓
5. Name two universal gate. (1) 1/2 = 01
   NAND & NOR ✓
6. State Moore's Law. (1)
   .375 x2 = 0.750 .750 x2 = 1.500 .500 x2 = 1.000
   The density of the integrated chip will double every 18 months
7. Draw circuit diagram using basic gates for Boolean function **F(x, y, z) = x + y'z** (1)



8. The number of distinct Boolean functions with *n* input variables is 2^n (1) ✓
9. Fill the blank box with Hamming code redundant bit. (1/2)
   0 1 0 0 [1] **1 0 1** [1] **1** [1] [1] 1010
10. What is difference between Decoder and Multiplexer (1)
    Decoder decodes many inputs into one final output. It's used frequently to locate one proper memory address
    Multiplexer controls acceptance of ~~one~~ one input. Has a control system that allows & selects only one input

II. **(10 pts.)** Given the two following binary numbers:

N1 = 1001 1001
N2 = 0001 0001

Which of these two larger when represented using

i. Unsigned binary number
ii. Signed-magnitude representation
iii. 1's complement representation.
iv. 2's complement representation
v. BCD representation.

***Equivalent number in decimal must be shown in each cases for full credit**

Unsigned

$10011001 > 00010001$ ⟶ Unsigned $(153)_{10} > (17)_{10}$

Signed Magnitude

$10011001 < 00010001$ ⟶ Signed Magnitude $(-25)_{10} < (17)_{10}$

One's Complement

$10011001 < 00010001$ ⟶ One's Complement $(-102)_{10} < (17)_{10}$

Two's Complement

$10011001 < 00010001$ ⟶ Two's Complement $(-103)_{10} < (17)_{10}$

BCD

$10011001 > 00010001$ ⟶ BCD $(99)_{10} > (11)_{10}$

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85 = 01010101
43 = 00101011

III. [10 Points]

Find the sum of -85 and -43

I. Using one's complement addition
II. Using two's complement addition

-85
-43
-128

Please verify if the results are correct or not, if not give **one line** explanation

$(-85)_{10} = 10101010$

$(-43)_{10} = 11010100$

ONE'S

carry 1

```
  10101010
+ 11010100
----------
  01111110
         1
----------
  01111111
```

$= (-128)_{10}$

carry 1 discard

$(-85)_{10} = 10101011$

$(-43)_{10} = 11010101$

TWO'S

```
  10101011
+ 11010101
----------
 100000000
```

$= (-128)_{10}$

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IV. Simplify the following Boolean Expressions. The final expression should have least number of literals.
No credit if you do not show the intermediate steps.

See reference page for rules

a. (4 pts) Use Boolean Laws (listed at the last page)

$$\overline{(X+Y)\,(X+\bar{Y})\,(\bar{X}+Z)} =$$

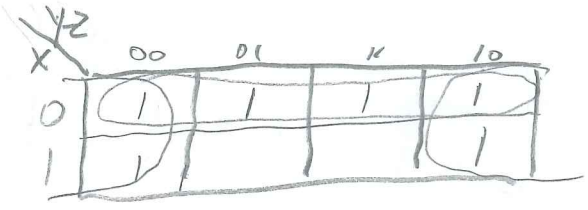
$(X'Y')+(X'Y)+(XZ')$

$X'(Y'+Y)+(XZ')$

$X'(1)+(XZ')$

$X'+(XZ')$

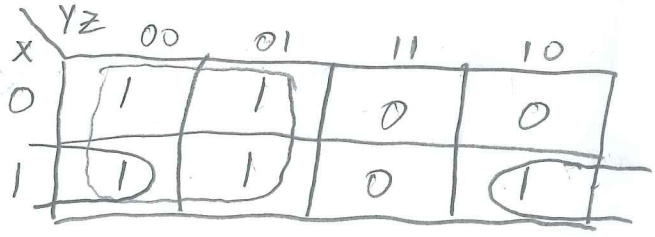
$X'+Z'$ (4)



$Z'+X'$

b. (6 pts) Use K-Map
F(X, Y, Z) **= Y'Z' + Y'Z + XYZ'**

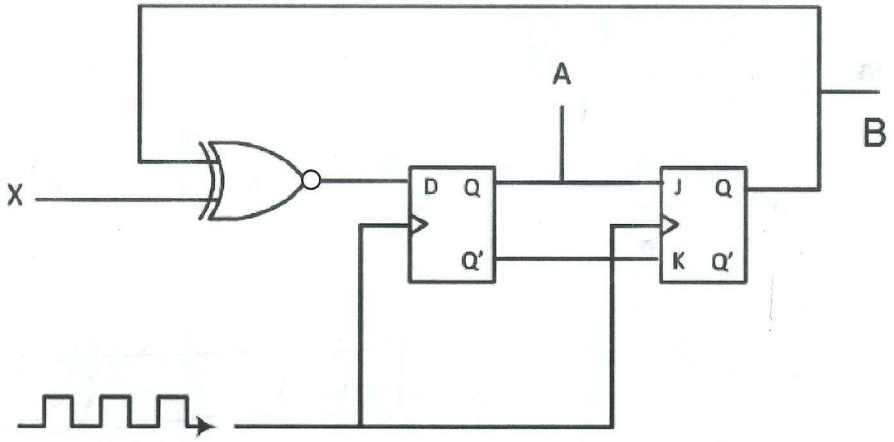
00 01 11 10



$= Y' + XZ'$

(6)

V. **[10 Points]** Complete the Truth Table for given Sequential Circuit.



Present State			Next State	
A	B	X	A	B
0	0	0	1	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	0
1	0	0	1	1
1	0	1	0	1

10

Identity Name	AND Form	OR Form
Identity Law	$1x = x$	$0 + x = x$
Null (or Dominance) Law	$0x = 0$	$1 + x = 1$
Idempotent Law	$xx = x$	$x + x = x$
Inverse Law	$xx' = 0$	$x + x' = 1$
Commutative Law	$xy = yx$	$x + y = y + x$
Associative Law	$(xy)z = x(yz)$	$(x + y) + z = x + (y + z)$
Distributive Law	$x + (yz) = (x + y)(x + z)$	$x(y + z) = xy + xz$
Absorption Law	$x(x + y) = x$	$x + xy = x$
DeMorgan's Law	$(xy)' = x' + y'$	$(x + y)' = x'y'$
Double Complement Law	$x'' = x$	

TABLE 3.5 Basic Identities of Boolean Algebra

Extra Equivalent Boolean Expression

1. $X + \overline{X} \cdot Y = X + Y$

2. $X(\overline{X} + Y) = X \cdot Y$

AND

(1) $A \cdot 0 = 0$

(2) $A \cdot 1 = A$

(3) $A \cdot A = A$

(4) $A \cdot A' = 0$

OR

(5) $A + 0 = A$

(6) $A + 1 = 1$

(7) $A + A = A$

(8) $A + A' = 1$

MISC

(9) $A'' = A$

(10) $A + AB = A$

(11) $A + A'B = A + B$

(12) $A + (BC) = (A + B)(A + C)$