Name: _____ Roll No.: _____ Section: _____

A

ESC201A: Introduction to Electronics
Quiz -3

Date: 03.11.2016

1. (a) Convert $(153)_{10}$ to octal number system. **(1 marks)**

Divide 153 by 8.

$\frac{1}{8} = 0.125$

153	remainder
19	1
2	3
0	2

$(153)_{10} = (231)_8$

(b) Convert $(0.8125)_{10}$ to binary number. **(1 marks)**

Multiply by 2.

$(0.8125)_{10} = (.1101)_2$

0.	8125
1.	625
1.	25
0.	5
1.	0

2. Given two binary numbers X=1010100 and Y=1000011, perform the subtraction (a) X-Y and (b) Y-X using 2's compliment. **(3 marks)**

(a)

$\overline{Y} = 0111100$

2's complement of $Y = \overline{Y} + 1$

$= 0111101$

$$\text{Sum} = \begin{array}{r} 1010100 \\ 0111101 \\ \hline 10010001 \end{array}$$

carry

⇒ Discard carry.

$X - Y = 0010001$

(b)

$\overline{X} = 0101011$

2's complement of $X = 0101100$

$$\text{Sum} = \begin{array}{r} 1000011 \\ 0101100 \\ \hline 1101111 \end{array}$$

No end carry means negative number.

2's complement of sum $= 0010001$

$Y - X = -0010001$

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3. Obtain the minimized PoS by suitably using don't care terms. **(3 marks)**

wx \ yz	00	01	11	10
00	1	x	0	1
01	1	0	1	1
11	0	x	1	1
10	1	x	1	x

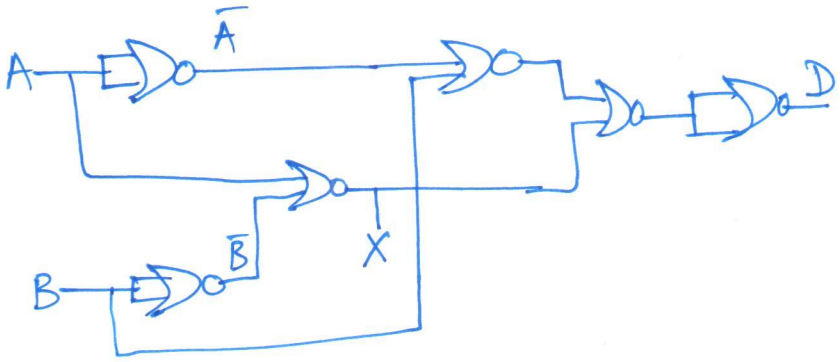
$f = (w+x+\bar{z})(\bar{w}+\bar{x}+y)(y+\bar{z})$

4. For a binary half-subtractor, having two inputs A and B, (a) find logical expressions for the outputs D (= A minus B) and X (= borrow), (b) implement the functions with minimum number of NOR Gates. **(4 marks)**

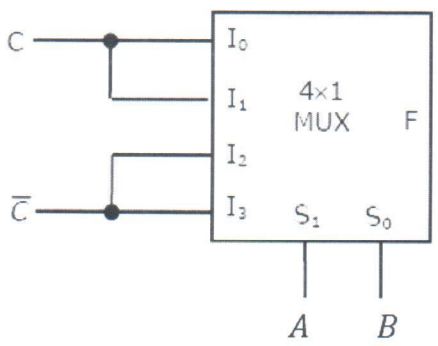
A	B	D=A-B	X=Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

$D = A\bar{B} + \bar{A}B$

$X = \bar{A}B$



5. What is the logic realized by the circuit shown in Figure below? **(3 marks)**



A	B	F	
0	0	C	$F = \bar{A}C$
0	1	C	
1	0	$\bar{C}$	$F = A\bar{C}$
1	1	$\bar{C}$	

THUS $F = \bar{A}C + A\bar{C} = A \oplus C$

Name: _____ Roll No.: _____ Section: _____

B

ESC201A: Introduction to Electronics
Quiz -3

Date: 03.11.2016

1. (a) Convert $(151)_{10}$ to octal number system. **(1 marks)**

Divide by 8

$\frac{1}{8} = 0.125$

151	Remainder
18	7
2	2
0	2

$(151)_{10} = (227)_8$

(b) Convert $(0.125)_{10}$ to binary number. **(1 marks)**

Multiply by 2.

$(0.125)_{10} = (.001)_2$

0.	125
0.	25
0.	5
1.	0

2. Given two binary numbers A=1010100 and B=1000011, perform the subtraction (a) A-B and (b) B-A using 2's compliment. **(3 marks)**

(a) $\overline{Y} = 0111100$

2's complement of $Y = \overline{Y} + 1$
$= 0111101$

$$\text{Sum} = \begin{array}{r} 1010100 \\ 0111101 \\ \hline 10010001 \end{array}$$

(1 ← carry)

⇒ Discard carry.

$X - Y = 0010001$

(b) $\overline{X} = 0101011$

2's complement of $X = 0101100$

$$\text{Sum} = \begin{array}{r} 1000011 \\ 0101100 \\ \hline 1101111 \end{array}$$

No end carry means negative number

2's complement of Sum = 0010001

$Y - X = -0010001$

Name: _____ Roll No.: _____ Section: _____

3. Obtain the minimized PoS. **(3 marks)**

WX \ YZ	00	01	11	10
00	0	1	0	1
01	1	1	1	1
11	1	0	1	1
10	0	0	0	0

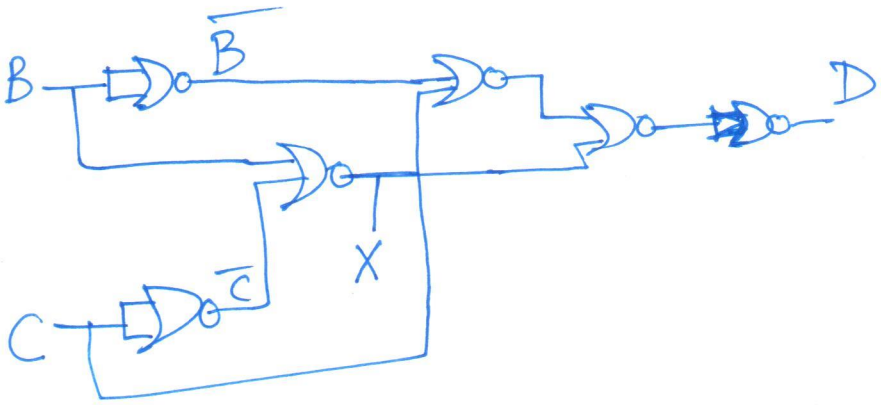
$f = (x+y+z).(x+\bar{y}+\bar{z}).(\bar{w}+y+\bar{z}).(\bar{w}+x)$

4. For a binary half-subtractor, having two inputs B and C, (a) find logical expressions for the outputs D (= B minus C) and X (= borrow), (b) implement the functions with minimum number of NOR Gates. **(4 marks)**

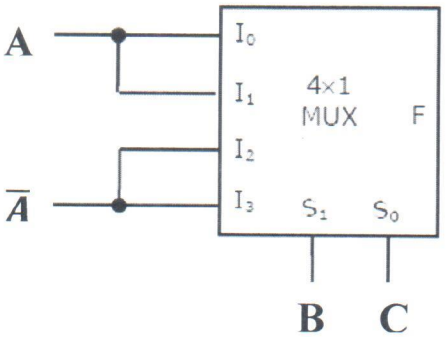
B	C	D=B−C	X
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

$D = B\bar{C} + \bar{B}C$

$X = \bar{B}C$



5. What is the logic realized by the circuit shown in Figure below? **(3 marks)**



B	C	F	
0	0	A	$f = \bar{B}A$
0	1	A	
1	0	$\bar{A}$	$f = B\bar{A}$
1	1	$\bar{A}$	

THUS $f = A\bar{B} + \bar{A}B = A \oplus B$