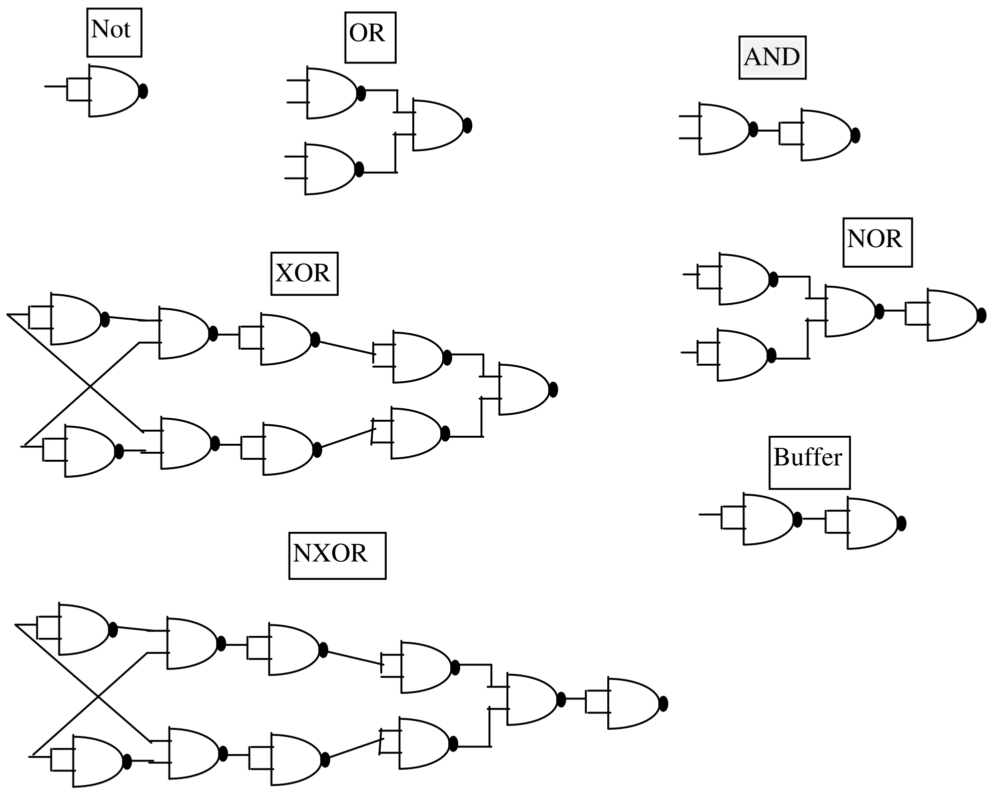
CMSC 311- Computer Organization

Fall 1995 - Assignment #1 (Solutions)

1.)



2.)

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

	00	01	11	10
0	1	0	1	1
1	1	0	1	1

F(A,B,C) = B + C'

3.) a)

$(x + y)x + (x + y)y'$	
$xx + xy + xy' + y'y$	13
$x + xy + xy' + yy'$	6
$x + xy + xy' + 0$	8
$x + xy + xy'$	1
$x + x(y + y')$	13
$x + x(1)$	7
x	5

b)

$xyz + x'y + xyz'$	
$xyz + xyz' + x'y$	9
$xy(z+z') + x'y$	13
$xy + x'y$	7 & 4

c)

$x + xz + yx + xyz + x'yz$	
$x + xz + xy + yz(x + x')$	13
$x + xz + xy + yz$	7 & 4
$x(1+z) + xy + yz$	13
$x + xy + yz$	7 & 4
$x (1 + y) + yz$	13
$x + yz$	7 & 4
y	13 & 7 & 4

d)

$y (xz' + ((x' + z) y)')$	
$xyz' + y((x' +z)y)'$	13
$xyz' + y((x' + z)' + y')$	16
$xyz' + y((x')'z' + y')$	15
$xyz' + y(xz' + y')$	17
$xyz' + xyz' + yy'$	13
$xyz' + yy'$	5
xyz'	8

4.) a) $AB + A(CD + CD') = AB + AC(D + D') = A(B+C)$

b) $(BC' + A'D)(AB' + CD') = ABB'C' + A'AB'D + A'CD'D = 0$

5.) a) $(A + B)'(A' + B')' = (A'B')(AB) = 0$

b) $A + A'B + A'B' = A + A'(B+B') = A + A' = 1$

6.) a.) $(x \supset y)\supset z = (x' + y) \supset z = (x' + y)' + z = xy' + z$

$x \supset (y\ x \supset z)) = x' + (y \supset z) = x'\ (y' + z) = x' + y' + z$

Consider the truth table for each of these two expressions:

X	Y	Z	XY' + Z	X' + Y' + Z
0	0	0	0	1
0	0	1	1	1
0	1	0	1	1
0	1	1	1	1
1	0	1	1	1
1	1	0	0	0
1	1	1	1	1

Therefore it's false.

b) $x \supset y = x' + y$ and $y \supset x = y' + x$

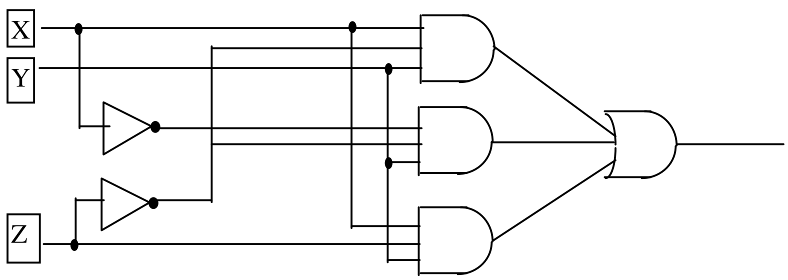
X	Y	X' + Y	Y' + X
0	0	1	1
0	1	1	0
1	0	0	1
1	1	1	1

Therfore it's false.

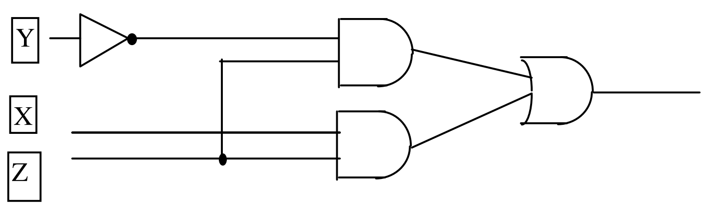
7) a)

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

b) $F = XY'Z + X'Y'Z + XYZ$



c) $F = xy'z + x'y'z + xyz$
$= y'z(x + x') + xz(y + y')$
$= y'z + xz$



d) same as a

8) a) $F(a,b,c) = \sum(0,1,2,3)$

	00	**01**	**11**	**10**
0	1	1	1	1
1	0	0	0	0

F(a,b,c) = A’

a) F(a,b,c) = abc’ + ab’c’ + a’bc’ + a’bc

	00	**01**	**11**	**10**
0	0	0	1	1
1	1	0	0	1

F9a,b,c) = ac’ + a’b

a) F(a,b,c,d) = $\sum$(1,2,4,5,7,8,10,11,13,14)

	00	**01**	**11**	**10**
00	0	1	0	1
01	1	1	1	0
11	0	1	0	1
10	1	0	1	1

F(a,b,c,d) = a’c’d + bc’d + a’bc’ + a’bd + ab’d’ + ab’c + acd’ + b’cd’

a) F(a,b,c,d) = a’b’c + ad + bd’ + cd’ + ac’ + a’b’

	00	**01**	**110**	**10**
00	1	1	1	1
01	1	0	0	1
11	1	1	1	1
10	1	1	1	1

F(a,b,c,d) = b’ + a + d’