EECS 150
Problem Set 1 Solution
Fall 2003

1.

a. $1011\ 0101_2 = 265_8 = 181_{10} = B5_{16}$

b. $100.1001_2 = 4.44_8 = 4.5625_{10} = 4.9_{16}$

c. $150_{16} = 1\ 0101\ 0000_2 = 520_8 = 336_{10}$

d. $3.244_{16} = 11.0010\ 0100\ 01_2 = 3.1104_8 = 3.141601563_{10}$

e. $247_{10} = 1111\ 0111_2 = 367_8 = F7_{16}$

2.

1101100_2	108_{10}	$6C_{16}$
$+\ 1110101_2$	$+\ 117_{10}$	$+\ 75_{16}$
11100001_2	225_{10}	$E1_{16}$

11011_2	27_{10}	$1B_{16}$
$\times\ 101101_2$	$\times\ 45_{10}$	$\times\ 2D_{16}$
11011_2	135_{10}	$15F_{16}$
110110_2	$+\ 108_{10}$	$+\ 36_{16}$
11011_2	1215_{10}	$4BF_{16}$
$+\ 110110_2$		
10010111111_2		

3.

a. $150_{10} \pmod 8 = 6_{10}$ ($150_{10} / 8 = 18$ remainder 6)

b. $150_{10} \pmod 4 = 2_{10}$ ($150_{10} / 4 = 37$ remainder 2)

c. No. For example: $x = 1$, $y = 1$
$x \pmod 2 = 1$; $y \pmod 2 = 1$;
$x \pmod 2 + y \pmod 2 = 2$; $(x+y) \pmod 2 = 0$
therefore, $x \pmod 2 + y \pmod 2 \neq (x+y) \pmod 2$

4.

a.
$F = AB(C + C') + AB'$
$= AB + AB'$ (complementarity)
$= A(B + B')$ (distributive)
$= A$ (complementarity)

b.
$F = AB + BCD' + A'CD'$
$= AB + A'CD'$ (consensus)

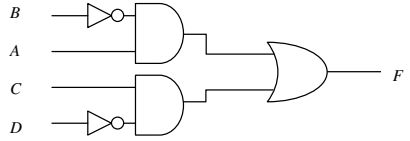
c.
$F = (A(B + C)'D)'$
$= A' + (B + C) + D'$ (DeMorgan's)
$= A' + B + C + D'$ (associative)

d.
$F = (AB'C')'$
$= A' + B + C$ (DeMorgan's)

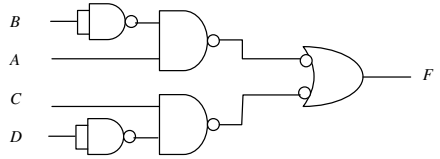
e.
$F = (A + B)(A' + B + C)(A' + B + C')$
$= B + (A(A' + C)(A' + C'))$ (distributive)
$= B + (A(A'))$ (simplification)
$= B$ (complementarity)

5. Implement $F.H = AB' + CD'$

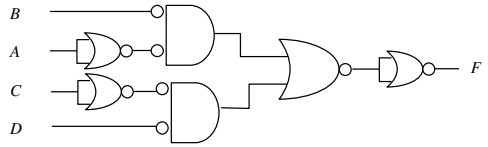
a.



b.



c.



6.

a.

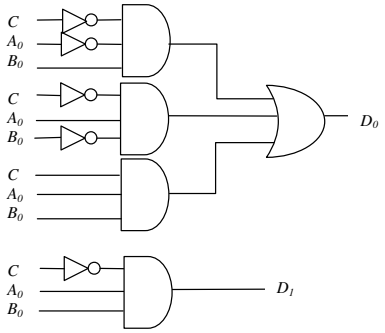
C	A_0	B_0	D_1	D_0
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	0	1

b.

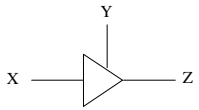
D_0 = C'A_0'B_0 + C'A_0B_0' + CA_0B_0

D_1 = C'A_0B_0

c. (Could be simplified, but was not required)



7. a) The circuit functions as a tri-state buffer:



b) F = a + b.c + d

c) F = a ⊕ b