EECS 150
Problem Set 1 Solution
Fall 1999

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.

$$\begin{array}{r}
{\scriptstyle 1\,1\,1\,1\,1} \\
1101100_2 \\
+\ 1110101_2 \\
\hline
11100001_2
\end{array}
\qquad
\begin{array}{r}
{\scriptstyle 1}\phantom{00_{10}} \\
108_{10} \\
+\ \ 117_{10} \\
\hline
225_{10}
\end{array}
\qquad
\begin{array}{r}
{\scriptstyle 1}\phantom{C_{16}} \\
6C_{16} \\
+\ \ \ 75_{16} \\
\hline
E1_{16}
\end{array}$$

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

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)

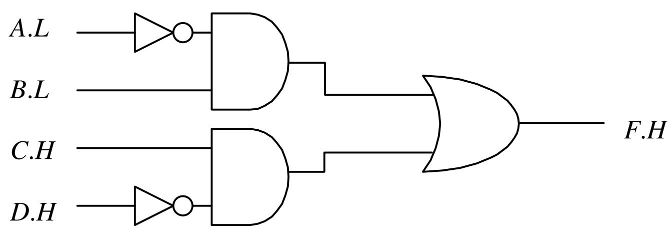
c. $F = (A(B + C)'D)'$
$= A' + (B + C) + D'$ (DeMorgan's)
$= A' + B + C + D'$ (associative)

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

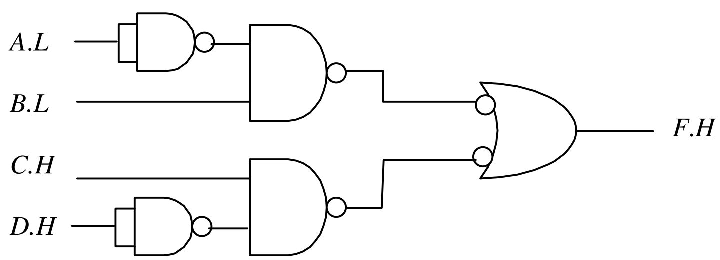
e. $F = (A + B)(A' + B + C)(A' + B + C')$
$= B + (A(A' + C)(A' + C'))$ (distributive)
$= B + (A(A'))$ (simplification)
$= B$ (complementarity)

5. Implement $F.H = AB' + CD'$ where inputs are $A.L$, $B.L$, $C.H$, $D.H$

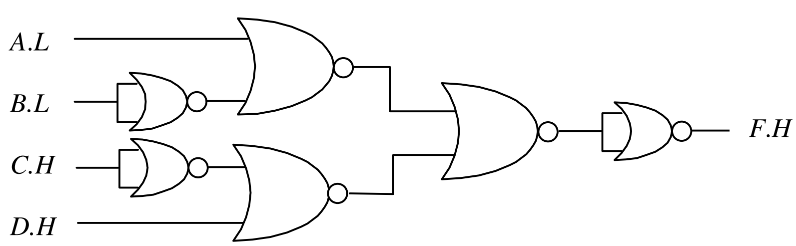
a.



b.



c.



6.

a.

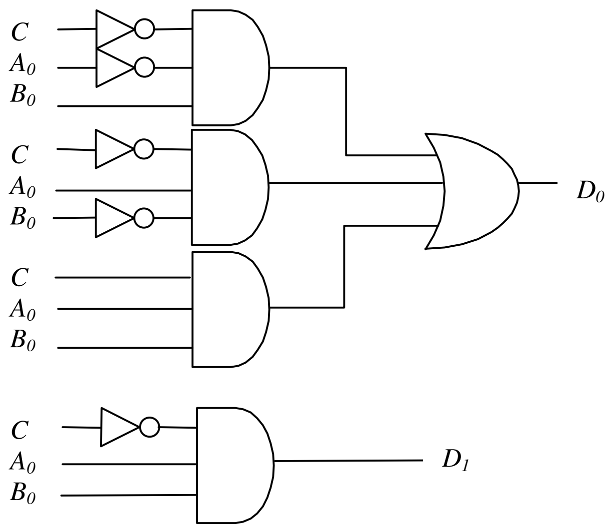
C	A_0	B_0	D_1	D_0
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	0	1

b.

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

$D_1 = C'A_0B_0$

c.



7.