CSE 370, HW2 Key
Spring 2007

Graded questions:
1 (1p), 2 (1p), 4 (2p), 6 (3p), 7 (1p)

1) $\overline{f}=\overline{(A\vee\overline{BCD})}\vee\overline{(\overline{AD}\vee B(\overline{C}\vee A))}=(\overline{A}\wedge BCD)\vee(AD\wedge\overline{B(\overline{C}\vee A)})$
$=\overline{A}BCD\vee(AD\wedge(\overline{B}\vee C\overline{A}))=\overline{A}BCD\vee AD\overline{B}$

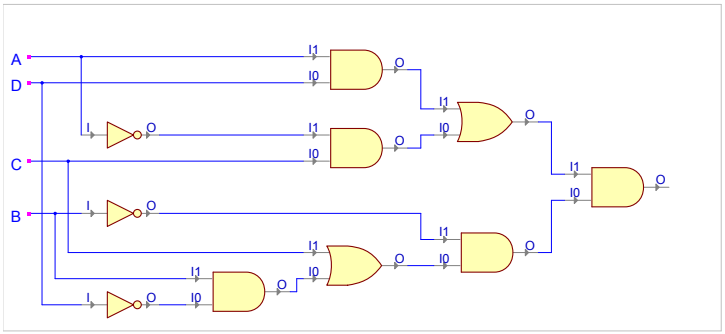
2) $f=\overline{\overline{X\wedge\overline{X\wedge Y}}\wedge\overline{Y\wedge\overline{X\wedge Y}}}=(X\wedge\overline{X\wedge Y})\vee(Y\wedge\overline{X\wedge Y})=(X\wedge(\overline{X}\vee\overline{Y}))\vee(Y\wedge(\overline{X}\vee\overline{Y}))$
$=X\overline{X}\vee X\overline{Y}\vee Y\overline{X}\vee Y\overline{Y}=X\overline{Y}\vee Y\overline{X}=X$ xor Y

3) Name the intermediate outputs S' and C_1 (for the left HA) and C_2 (for the right HA)

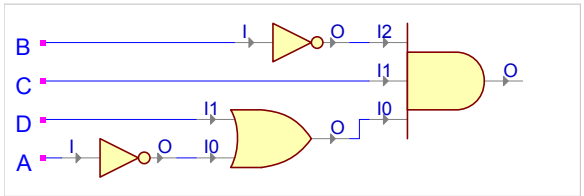
A	***B***	C_{in}	***S'***	C_1	***S***	C_2	C_{out}
0	0	0	0	0	*0*	0	*0*
0	0	1	0	0	*1*	0	*0*
0	1	0	1	0	*1*	0	*0*
0	1	1	1	0	*0*	1	*1*
1	0	0	1	0	*1*	0	*0*
1	0	1	1	0	*0*	1	*1*
1	1	0	0	1	*0*	0	*1*
1	1	1	0	1	*1*	0	*1*

The italic columns are equal to the truth table of the FA.

4) a)



b) $f=(AD\vee\overline{A}C)(\overline{B}(C\vee B\overline{D}))=(AD\vee\overline{A}C)\overline{B}C=A\overline{B}CD\vee\overline{A}\overline{B}C$
$=A\overline{B}CD\vee\overline{A}\overline{B}CD\vee\overline{A}\overline{B}C=\overline{B}CD\vee\overline{A}\overline{B}C=\overline{B}C(D\vee\overline{A})$



5) a) $f=\overline{A}\overline{B}\overline{C}\overline{D}\vee\overline{A}\overline{B}\overline{C}D\vee\overline{A}\overline{B}C\overline{D}\vee\overline{A}BCD\vee A\overline{B}\overline{C}\overline{D}\vee A\overline{B}\overline{C}D\vee A\overline{B}C\overline{D}\vee ABCD$

b) $f=(A\vee B\vee \overline{C}\vee \overline{D})(A\vee \overline{B}\vee C\vee D)(A\vee \overline{B}\vee C\vee \overline{D})(A\vee \overline{B}\vee \overline{C}\vee D)(\overline{A}\vee B\vee \overline{C}\vee \overline{D})$
$\wedge(\overline{A}\vee \overline{B}\vee C\vee D)(\overline{A}\vee \overline{B}\vee C\vee \overline{D})(\overline{A}\vee \overline{B}\vee \overline{C}\vee D)$

c) $f=\sum m(3,4,5,6,11,12,13,14)=A\overline{B}\overline{C}\overline{D}\vee A\overline{B}CD\vee A\overline{B}C\overline{D}\vee A\overline{B}\overline{C}D\vee \overline{A}B\overline{C}\overline{D}$
$\vee\overline{A}\overline{B}CD\vee\overline{A}B\overline{C}D\vee\overline{A}\overline{B}C\overline{D}\vee\overline{A}\overline{B}\overline{C}D$

d) $f=\prod M(0,1,2,7,8,9,10,15)=(A\vee B\vee C\vee D)(A\vee B\vee C\vee \overline{D})(A\vee B\vee \overline{C}\vee D)$
$\wedge(A\vee \overline{B}\vee \overline{C}\vee \overline{D})(\overline{A}\vee B\vee C\vee D)(\overline{A}\vee B\vee C\vee \overline{D})(\overline{A}\vee B\vee \overline{C}\vee D)(\overline{A}\vee \overline{B}\vee \overline{C}\vee \overline{D})$

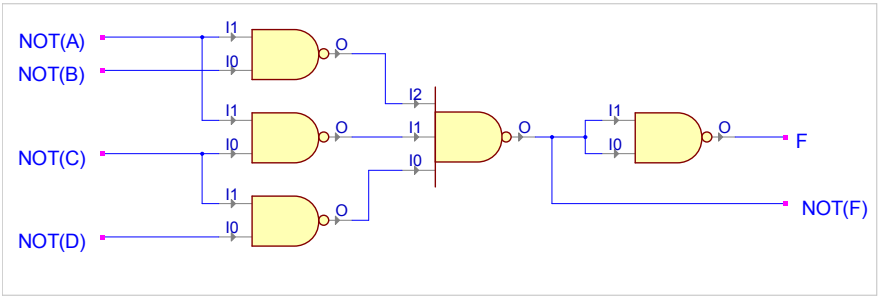
6) a) $F=\prod M(0,1,2,3,4,5,8,12)$

b) $F=(A\vee B)(A\vee C)(C\vee D)$

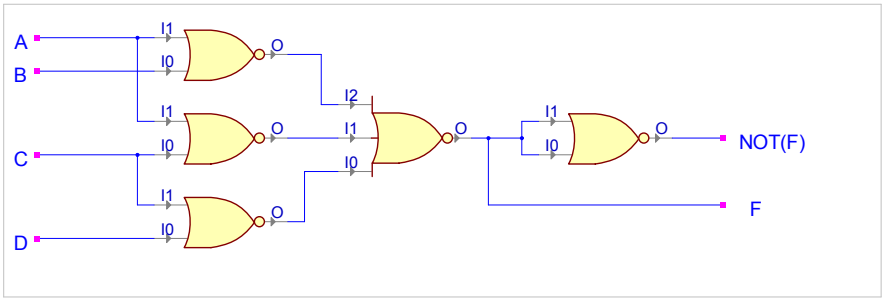
c) $\overline{F}=(\overline{A}\vee \overline{C})(\overline{A}\vee \overline{D})(\overline{B}\vee \overline{C})$

d) $\overline{F}=\overline{A}\,\overline{B}\vee\overline{A}\,\overline{C}\vee\overline{C}\,\overline{D}$

e) $F=\overline{\overline{A}\vee B}\;\overline{\overline{A}\vee C}\;\overline{\overline{C}\vee D}=\overline{\overline{A}}\wedge\overline{B}\wedge\overline{\overline{A}}\wedge\overline{C}\wedge\overline{\overline{C}}\wedge\overline{D}$



f) $F=\overline{\overline{A}\vee B\vee\overline{A}\vee C\vee\overline{C}\vee D}$



7) $f(X,Y,Z)=Y\overline{X}\vee\overline{Y}X$, 4 literals (count all occurences to measure minimization resutl!)

--- X ---

Z				
	0 0	1 2	0 6	1 4
	0 1	1 3	0 7	1 5

--- Y ---