

PLD §04 Peter Pranishnikov Homework 3

3.23, 4.9, 4.16, 4.25, 4.32

3.23 No more than 2 NOR Gates:

$$F(A, B, C, D) = \sum m(2, 4, 20, 22, 24)$$

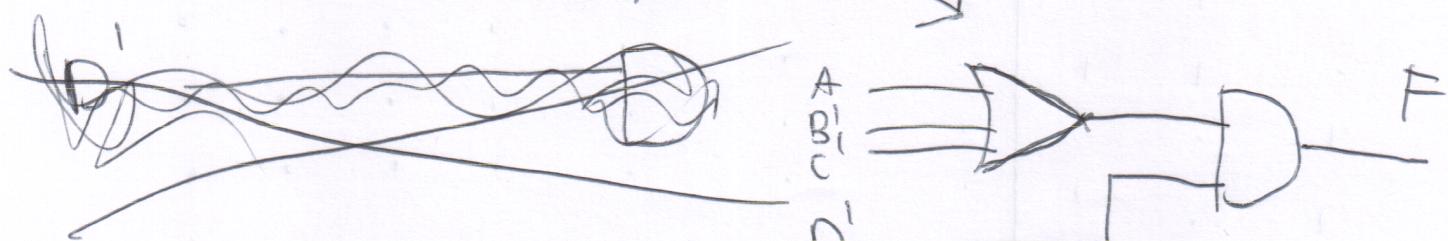
$$d(A, B, C, D) = \sum m(0, 1, 5, 8)$$

AB	CD	00	01	11	10
00	X	X	0	1	
01	1	X	0	0	
11	1	1	0	0	
10	X	0	0	0	

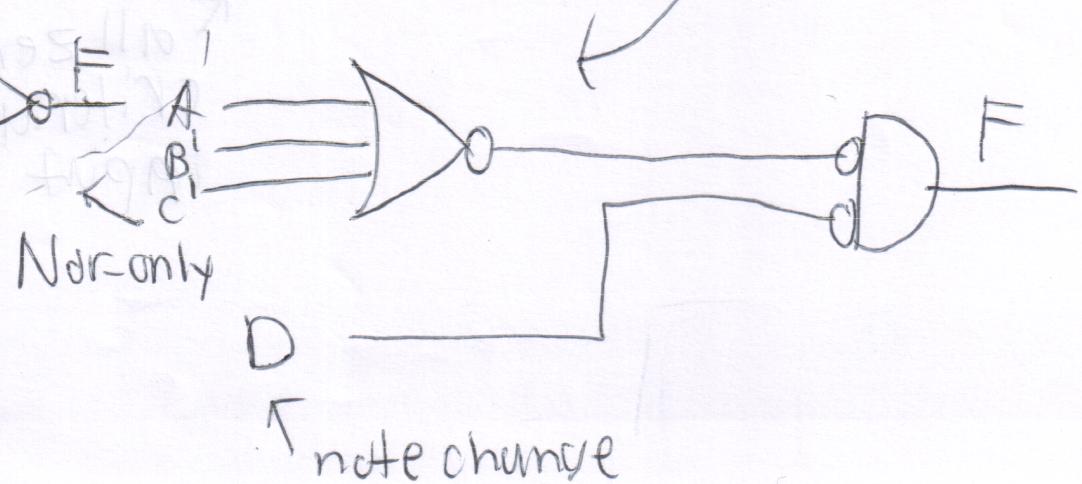
$$F' = D + A'B'C$$

$$F = (D + A'B'C)' = D'(A+B'+C')$$

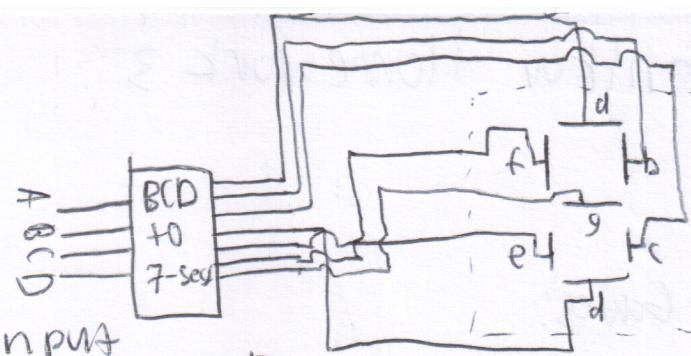
Normal AND-OR-AND



Push bubbles



49



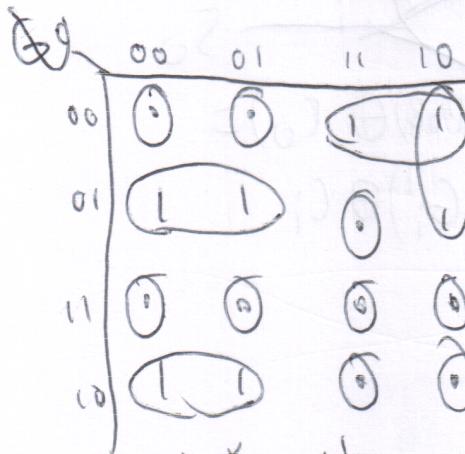
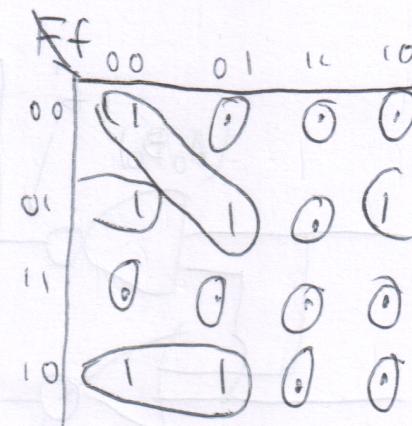
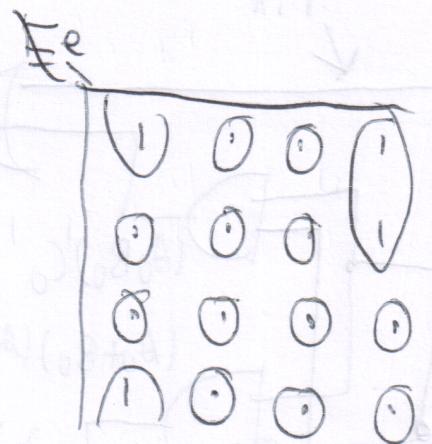
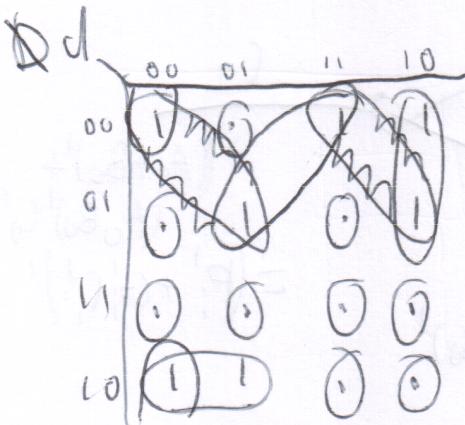
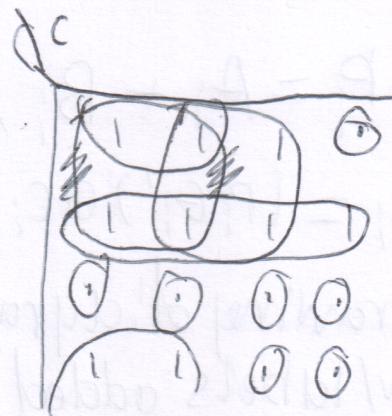
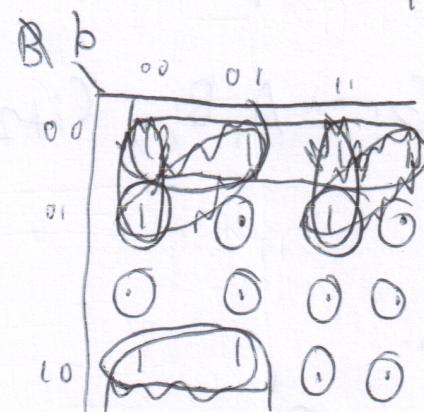
→ all zeros, per assignment
criterion for invalid input

4.9 K-maps (continued)

Legend AB^D

A' a

AB	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	1	1	1	1
10	1	1	1	1



$$c = \cancel{A'B'C'} + A'D + A'B$$

$$= A'(D+B) + \underline{B'C'}$$

$$e = B'C'D' + A'(D)$$

$$= D'(B'C') + A'(C)$$

$$= \cancel{D'(B'+A')}$$

design

on next page

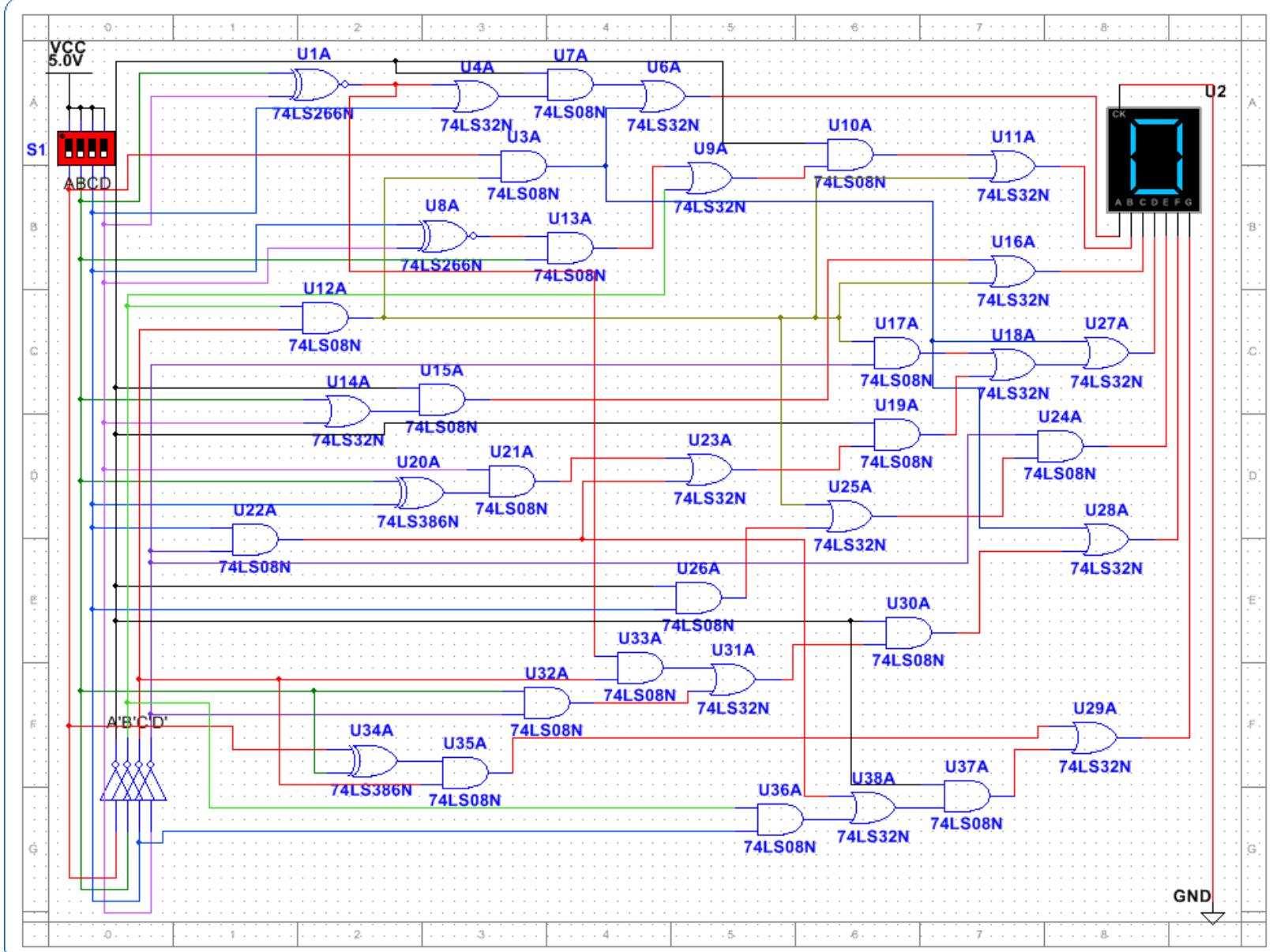
$$\begin{aligned} a &= A'(B \oplus D)' + A'C + ABC'C' \\ &= A'(B \oplus D)' + C + \underline{ABC'C'} \end{aligned}$$

$$\begin{aligned} b &= A'B' + B'C' + A'B(C \oplus D) \\ &= A'(B' + B(C \oplus D)') + \underline{B'C'} \end{aligned}$$

$$\begin{aligned} d &= A'B'C'D' + A'D(B \oplus C) + A'C'D' + ABC \\ &= \underline{B'C'D'} + A'(D(B \oplus C) + \underline{CD'}) \end{aligned}$$

$$\begin{aligned} f &= A'C'(B \oplus D)' + A'BD' + ABC' \\ &= A'(C'(B \oplus D)' + BD') + \underline{ABC'} \end{aligned}$$

$$\begin{aligned} g &= (A \oplus B)C' + A'B'C + A'C'D' \\ &= (A \oplus B)C' + A'(B'C + \cancel{CD'}) \end{aligned}$$

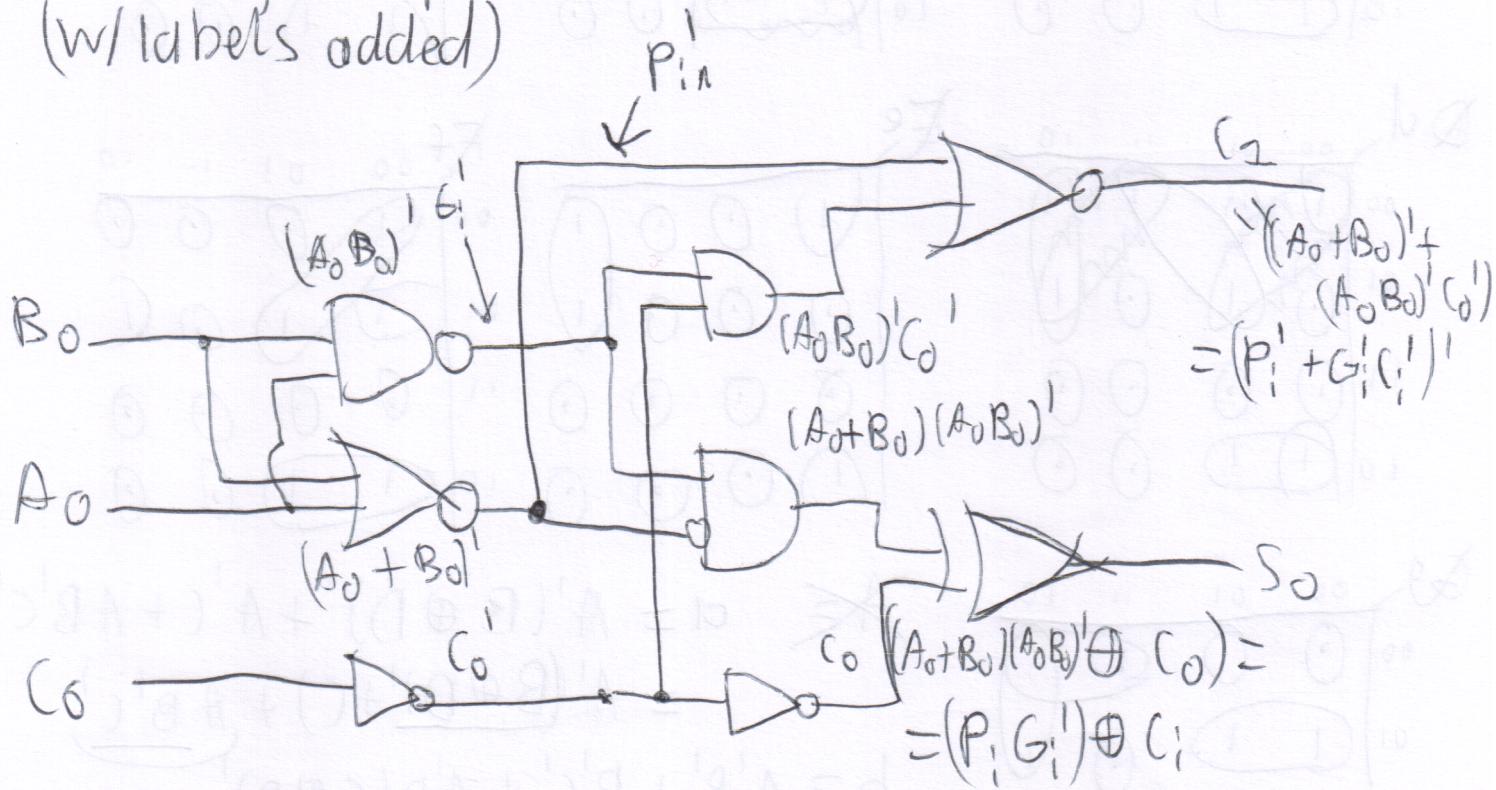


4.16 Something about proving:

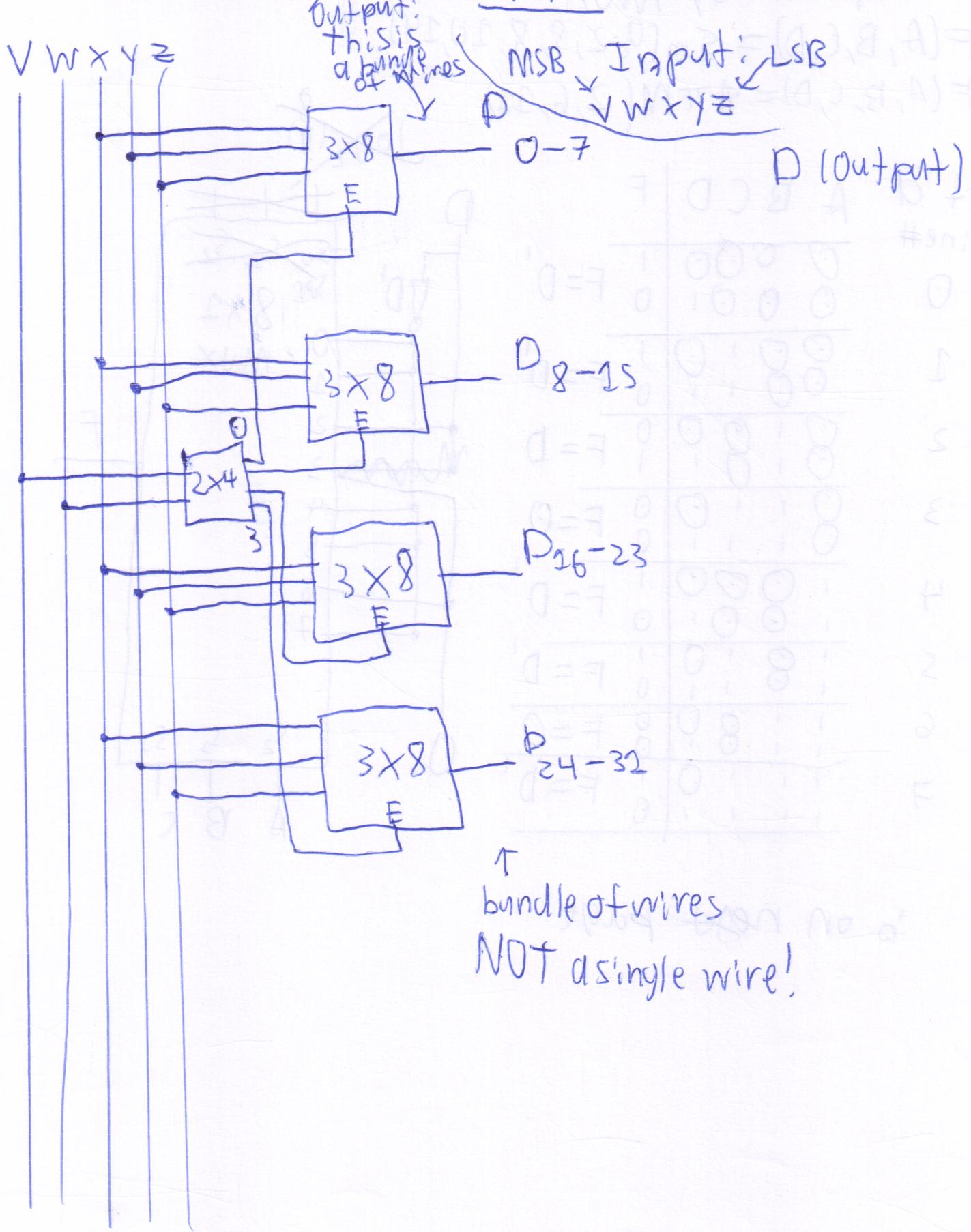
$$P_i = A_i + B_i, G_i = A_i B_i, C_{i+2} = (P_i' G_i' + P_i)^{1/2}$$

$$S_i = (P_i G_i') \oplus C_i$$

Redrawing diagram
(w/ labels added)



4.25 Assuming enable High (to enable decoder)



4.32 Implement w/ MUX

a) $F(A, B, C, D) = \sum m(0, 2, 5, 8, 10, 14)$

b) $F(A, B, C, D) = \prod M(2, 6, 12)$

part d
S1 Line #

	A	B	C	D	F
0	0	0	0	0	1
1	0	0	0	1	0
2	0	0	1	0	1
3	0	1	0	0	0
4	1	0	0	0	1
5	1	0	0	1	0
6	1	1	0	0	0
7	1	1	0	1	1

$$F = D'$$

$$F = D'$$

$$F = D$$

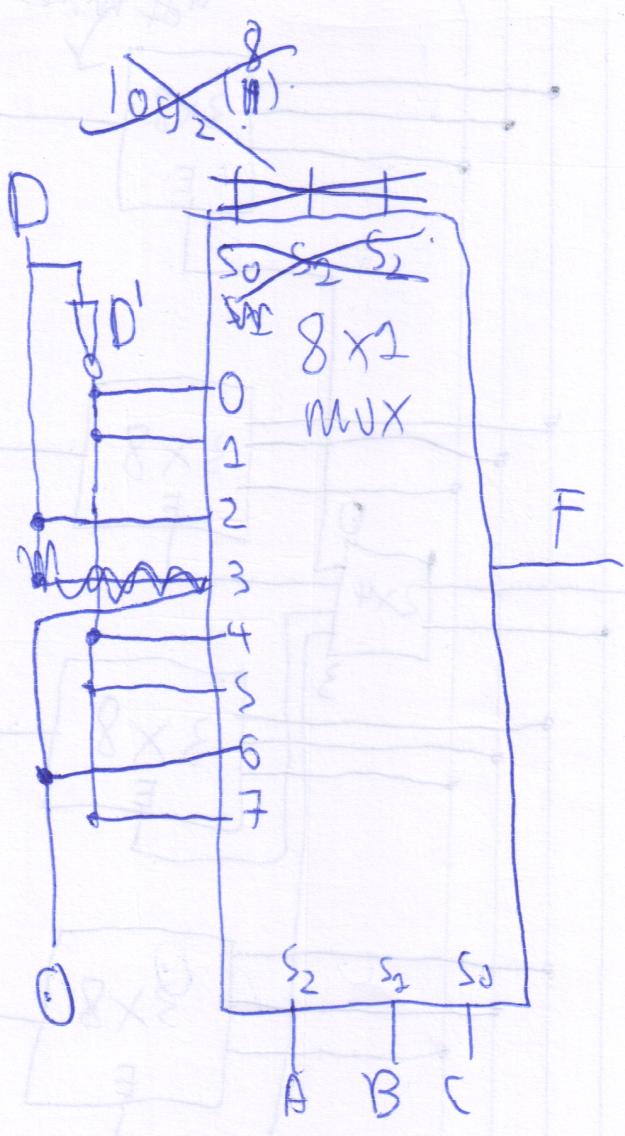
$$F = 0$$

$$F = D'$$

$$F = D'$$

$$F = 0$$

$$F = D'$$



b on next page

b) 4.32 cont'd
 $F(A, B, C, D) = \pi M(2, 6, 21)$

~~A B~~

A	B	C	D	F
0	0	0	0	1 $F=1$
0	0	0	1	1
0	0	1	0	0 $F=D$
0	0	1	1	1
0	1	0	0	1 $F=1$
0	1	0	1	1
0	1	1	0	0 $F=D$
0	1	1	1	1
1	0	0	0	1 $F=1$
1	0	0	1	1
1	0	1	0	1 $F=D'$
1	0	1	1	0
1	1	0	0	1 $F=1$
1	1	0	1	1
1	1	1	0	1 $F=1$
1	1	1	1	1

