Digital Logic Assign 1. 陈书信 12210731.

1. (a).

$$\begin{array}{r|l} 3 & 234 \\ 3 & 78 \; \cdots\cdots 0 \\ 3 & 26 \; \cdots\cdots 0 \\ 3 & 8 \; \cdots\cdots 2 \\ 3 & 2 \; \cdots\cdots 2 \\ & 0 \; \cdots\cdots 2 \end{array}$$

$(234)_{10} = (22200)_3$

$$\begin{array}{r} 0.5 \\ \times\ 3 \\ \hline 0.5 \; \cdots\cdots 1 \\ \times\ 3 \\ \hline 1.5 \; \cdots\cdots 1 \end{array}$$

$\therefore (0.5)_{10} = (0.1111\cdots1)_3$

$(234.5)_{10} = (22200.\dot{1})_3$

(b).

$$\begin{array}{r|l} 12 & 234 \\ 12 & 19 \; \cdots 6 \\ 12 & 1 \; \cdots 7 \\ & 0 \; \cdots 1 \end{array}$$

$$\begin{array}{r} 0.5 \\ \times\ 12 \\ \hline 6.0 \; \cdots 6 \end{array}$$

$(234.5)_{10} = (176.6)_{12}$

(c). $(435)_6 = 5\times6^0 + 3\times6^1 + 4\times6^2$

$5\times1 + 3\times6 + 4\times6^2 = (167)_{10}$

(d) $\underbrace{10}\underbrace{110}.\underbrace{010}\underbrace{100}$

$(26.24)_8$

2 (a) base $\to$ radix (6).

(b). $2+3\cdot b = 3x+2 \quad 20 = 2\cdot x. \quad 12.1 = 2+x+x\times\frac{1}{x} = 2+x+\frac{1}{x}$

radix $= 4$ $\quad \frac{3x^2+2}{2x} = \frac{3}{2}x + \frac{1}{x} \quad \frac{1}{2}x\cdot 4 = 2. \quad x = 4$

3. (a) $(a'+c)(a'+c')(a+b+c'd)$

$= (a'+cc')(a+b+c'd)$

$= a'(a+b+c'd)$

$= a'b + a'c'd = a'(b+c'd)$

(b). $abc'd + a'bd + abcd'$.

$= abd(c+c') + a'bd$.

$= bd(a+a') = bd$.

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4. (a). $(a+c)(a'+b+c)(a'+b'+c)$

$= (a+c)((a'+c)+bb')$

$= (a+c)(a'+c), = c+aa' = c$

(b). $F(a,b,c) = \sum(0,1,2,3,5)$

$= a'b'c' + a'b'c + a'bc' + a'bc + ab'c$

$= a'b' + a'b + ab'c = a' + ab'c$

5. (a). $F(a,b,c,d) = bd' + acd' + ab'c + a'c'$

$= b(c+c')d' + a(b+b')cd' + ab'c(d+d') + a'(b+b')c'$

$= bcd' + bc'd' + abcd' + ab'cd' + ab'cd + ab'cd' + a'bc' + a'b'c'$

$= abcd' + a'bcd' + a'bc'd' + abc'd' + ab'cd + abcd' + ab'cd' + ab'cd'$
$+ a'bc'd$
$+ a'b'c'd'$
$+ a'b'c'd$

$= \sum(\ ,6,4,12,11,14,10,5,0,1)$

$= \sum(0,1,4,5,6,10,11,12,\ ,14)$

(b). $F(x,y,z)$

$= (x'+y'y+z)(x'+y+zz')$

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

$= \Pi(6,4,5) = \Pi(4,5,6)$

6. (a). $F_1(A,B,C) = B(A'+C)$

$F_2(A,B,C) = (A \oplus C)' = (A'C + AC')'$

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

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(b).

A \ B C	00	01	11	10
0	0	0	1	1
1	0	0	1	0

by using K-Map $F_1(A,B,C) = BC + A'B$

$= B(A'+C)$.

$F_1(A,B,C) = BC + A'B$

A \ B C	00	01	11	10
0	1	0	0	1
1	0	1	1	0

$F_2(A,B,C) = AC + A'C'$

$F_2'(A,B,C) = A'C + AC'$

$F_2(A,B,C) = (F_2'(A,B,C))' = (A'C + AC')' = (A+C')(A'+C)$.

7. (a)

W X \ Y Z	00	01	11	10
00	1	0	1	1
01			1	1
11	1	1	1	
10			1	1

$F(W,X,Y,Z)$

$= YZ + W'Y + X'Y + WXY' + W'X'Z'$

(b). $F(A,B,C,D) = \prod(1,3,4,5,6,7,9,12,13,14)$

$= \sum(0,2,8,10,11,15)$

A B \ C D	00	01	11	10
00	1			1
01				
11			1	
10	1		1	1

$F(A,B,C,D)$

$= B'D' + ACD$

8. $F = f \cdot g$ is to find squares have both "1" in f and g. to simplify, I will use f_1, g_1 to differ different 1s.

$f(a,b,c,d)$

$g(a,b,c,d)$

	f_1		f_1
	f_1		f_1
f_1	f_1		f_1
	f_1		f_1

C, B, A, D

As for g. $g' = \cancel{a'b'd'}.(a+b+c+d')' + (b'+c'+d)' + (a'+c+d')'$

$= \cancel{ab} \; a'b'd + bcd' + ac'd$.

g

1	0	0	1
1	1	1	0
1	0	1	0
1	0	1	1

C, B, A, D

add two charts together we have

			F_1
	F_1		
F_1			
			F_1

C, B, A, D

So $F = B'CD' + ABC'D' + A'BC'D$

9. (a).

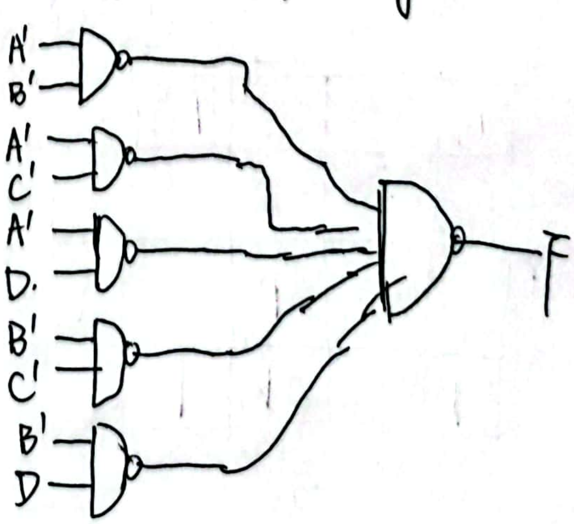
X	1	X	1
1	X	1	
1	1	1	

C, B, A, D

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

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

(NAND) only



$F'(A,B,C,D) = \cancel{AB} \; AB + ACD' + BCD'$.

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

$F(A,B,C,D) = (A'+B') \cdot (A'+C'+D) \cdot (B'+C'+D)$

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

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