LISTA 1

1) a) $1+2+4+16+32+64+512 = (641)_{10}$

b) $(2DD)_{16}$ c) $(1273)_8$ d) $1+4+8+32+64+128+\frac{1}{4}+\frac{1}{16}+\frac{1}{32}$

$= (237,34375)_{10}$

e) $(6A,AC)_{16}$ f) $(516,66)_8$ g) $4+2\cdot 25+1\cdot 125+3\cdot 5^4 = (2054)_{10}$

h) $13+7\cdot 16+16^2+15\cdot 16^3+11\cdot 16^4 = (782717)_{10}$

i) $(1010\ 0111\ 1102\ 1000)_2$ j) $(0111\ 0110\ 1110\ 1000\ 1100.0111\ 1011\ 1010)_2$

$= (1667214.3672)_8$

k) $2+9\cdot 7+5\cdot 7^2+7^3+3\cdot 7^4+6\cdot 7^5+4\cdot\frac{1}{7}+6\cdot\frac{1}{7^2}+5\cdot\frac{1}{7^3} =$

$(108663,708454810 49)_{10}$

l) $1+4\cdot 7+2\cdot 49+5\cdot 7^3+6\cdot 7^4+3\cdot 7^5+2\frac{1}{7}+3\frac{1}{49}+\frac{6}{7^5}$

$(66669,3644314868 7)_{10} = (202155,272455416136502 77)_8$

m) $2 + 6 \cdot 9 + 4 \cdot 81 + 7 \cdot 9^3 + 8 \cdot 9^4 + 3 \cdot 9^5 = (235118)_{10}$

n) $1 + 2 \cdot 3 + 2 \cdot 9 + 1 \cdot 27 + 1 \cdot 3^5 + 2 \cdot 3^6 + 1 \cdot 3^7 + 2 \cdot 3^9 = (43306)_{10}$

o)

2) a)

$$\begin{array}{r} 1011011101 \\ 11101101 \\ \hline 10111001010 \end{array}$$

3) Base 6:

$1 + 4x + x^2 = 61$

$x(4 + x) = 60$

$x(4 + x) = 10 \cdot 6$

$x = 6$

4) a) $(19)_{10} = (00010011)_{2/C1/C2}$

b) $(-53)_{10} = (00110101)_2 = (11001010)_{C1} = (11001011)_{C2}$

c) $(122)_{10} = (01111010)_{2/C1/C2}$

d) $(-106)_{10} = (01101010)_2 = (10010101)_{C1} = (10010110)_{C2}$

e) $(95)_{10} = (0101\ 1111)_{2/C1/C2}$

f) $(-37) = (0010\ 0101)_2 = (1101\ 1010)_{C1} = (11011011)_{C2}$

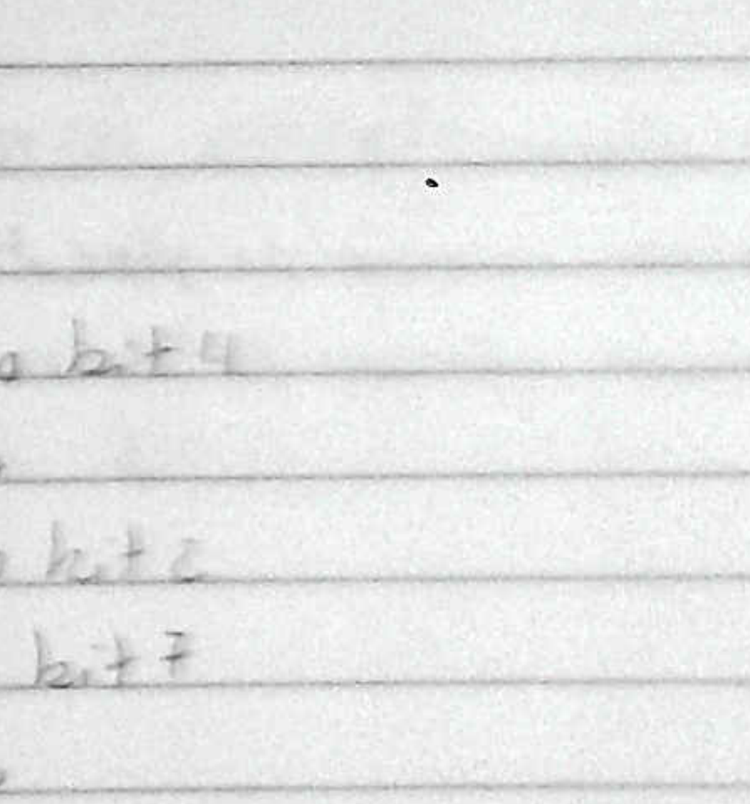
5) $(143)_{10} = (10001111)_2 = (0001\ \ 0100\ \ 0011)_{BCD/AIKEN}$

$(0100\ \ 0111\ \ 0110)_{STIBITZ}$

$(11001000)_{GRAY}$ $(00011\ \ 01001\ \ 00110)_{2DE5}$

(01 00010 01 10000 01 01000) [illegible]

1 bit	2 bits	3 bits	4 bits
c) 0	0 0	0 0 0	0 0 0 0
1	0 1	0 0 1	0 0 0 1
	1 1	0 1 1	0 0 1 1
	1 0	0 1 0	0 0 1 0
		1 1 0	0 1 1 0
		1 1 1	0 1 1 1
		1 0 1	0 1 0 1
		1 0 0	0 1 0 0
			1 1 0 0
			1 1 0 1
			1 1 1 0
			1 1 1 1
			1 0 1 0
			1 0 1 1
			1 0 0 1
			1 0 0 0



	a	b	c	d	Paridade
7)	0	0	0	0	1
	0	0	0	1	0
	0	0	1	0	0
	0	0	1	1	1
	0	1	0	0	0
	0	1	0	1	1
	0	1	1	0	1
	0	1	1	1	0
	1	0	0	0	0
	1	0	0	1	1
	1	0	1	0	1
	1	0	1	1	0
	1	1	0	0	1
	1	1	0	1	0
	1	1	1	0	0
	1	1	1	1	1

8) a) Erro no bit 4

b) Correto

c) Erro no bit 2

d) Erro no bit 7

e) Correto

f) Correto

g) Erro no bit 7

h) Correto

i) Erro no bit 6

j) Erro no bit 1

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LISTA 2

2) NOT: A NAND(A,A)

0 1

1 0

AND: A B NAND(A,B) NOT(NAND(A,B))

0 0 1 0

0 1 1 0

1 0 1 0

1 1 0 1

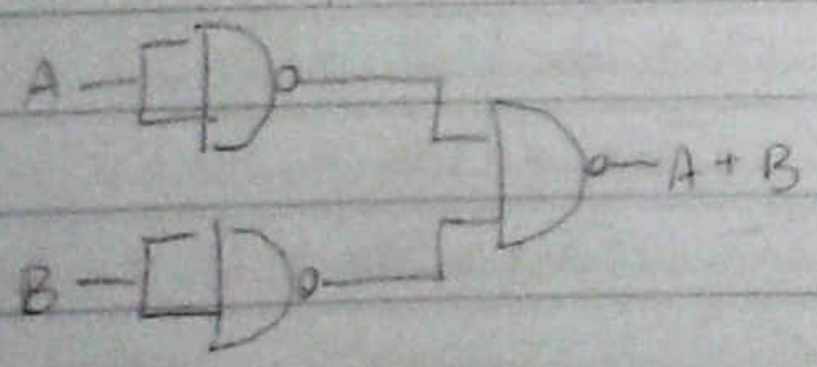
OR: A B NOT(A) NOT(B) NAND(NOT(A), NOT(B))

0 0 1 1 0

0 1 1 0 1

1 0 0 1 1

1 1 0 0 1



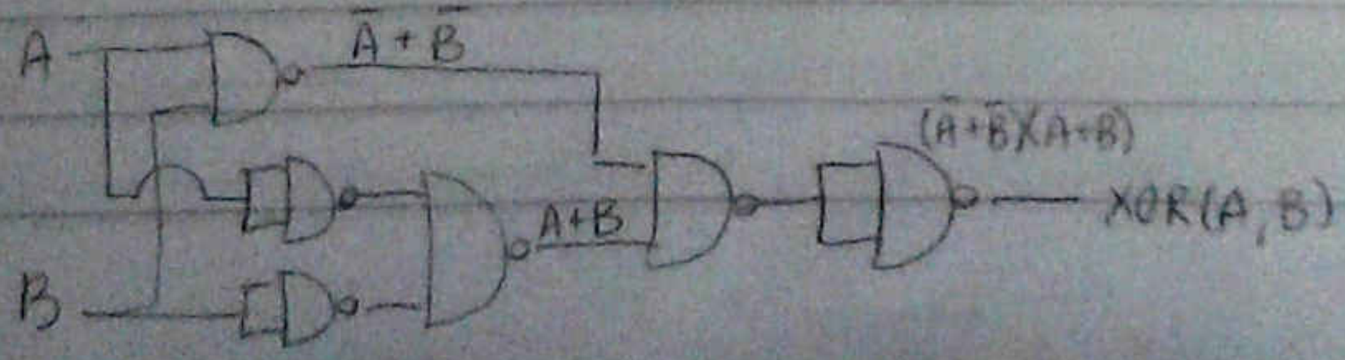
XOR: A B XOR(A,B) $\bar{A}B + A\bar{B}$ $(\bar{A}+\bar{B})(A+B)$

0 0 0 0

0 1 1 1

1 0 1 1

1 1 0 0



3. a) $\overline{xy + yz + zx} = (x+y)(y+z)(z+x)$

$\overline{(xy)}\,\overline{(yz)}\,\overline{(zx)}$

$(\bar{x}+\bar{y})(\bar{y}+\bar{z})(\bar{x}+\bar{z}) = (\bar{x}\bar{y} + \bar{y}\bar{y} + \bar{x}\bar{z} + \bar{y}\bar{z})(z+\bar{x}) = (\bar{x}\bar{y}\bar{z} + \bar{x}\bar{y} + \bar{y}\bar{z} + \bar{y}$
$+ \bar{x}\bar{z} + \bar{y}\bar{z} + \bar{y}\bar{z} + \bar{x}\bar{y}\bar{z})$

$= (\bar{x}\bar{y}\bar{z})(\bar{x}\bar{y})(\bar{x}\bar{z}) = (x+y+z)(x+y)(x+z)$

$= (x+y)(x+z)(y+z)(x+y)(x+z)$ (OK!)

b) $a\bar{x} + bx + ab$

(T.J.L) $a\bar{x} + bx + ab(x+\bar{x}) =$

$a\bar{x} + bx + abx + ab\bar{x} =$

$x(ab+b) + \bar{x}(ab+a) =$

$xb + \bar{x}a$ (OK!)

c) $\overline{(xy + yz + zx)}$

$(\bar{x}\bar{y})(\bar{y}\bar{z})(\bar{z}\bar{x}) = (\bar{x}+\bar{y})(\bar{y}+\bar{z})(\bar{z}+\bar{x}) = \bar{x}\bar{y}\bar{z} + \bar{x}\bar{y} + \bar{y}\bar{z} = \bar{x}\bar{z} + \bar{x}\bar{y} + \bar{y}\bar{z}$

d) $(a\bar{x} + b\bar{x}) = \bar{a}\bar{x} + \bar{b}x$

$(a\bar{x}(a+\bar{a}) + b\bar{x}(\bar{b}+b)(\bar{x}+x) =$

$\bar{x} + \bar{x}\bar{a} + \bar{x}b(\bar{x}+x) = \bar{x} + \bar{x}\bar{a} + \bar{x}b = \bar{x}\bar{a} + \bar{x}b$

f) $x + \bar{x}y = x + y$

4. a)
0101
0110
0111
1000
1011

$\bar{a}(c+d) + b(\bar{c}\bar{d} + cd)$

5) a)

A_0	A_1	A_2	P	S
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

6) a) $\overline{\overline{(x\bar{y})x} \cdot \overline{(x\bar{y})y}} \equiv (x\bar{y})x + (x\bar{y})y \equiv (\bar{x}+\bar{y})x + (\bar{x}+\bar{y})y \equiv$

$\bar{x}x + \bar{y}x + \bar{x}y + \bar{y}y \equiv \bar{y}x + \bar{x}y$

b) $\bar{c}ab + (\bar{a}+b)c \equiv \bar{c}ab + \bar{a}c + bc$

$\equiv \bar{a}b\bar{c} + \bar{a}bc + ab\bar{c} + abc$

$\equiv \bar{a}c(b+\bar{b}) + ab(c+\bar{c})$

$\equiv \bar{a}c + ab$

a	b	c	S	
0	0	0	0	
0	0	1	1	$\bar{a}\bar{b}c$
0	1	0	0	
0	1	1	1	$\bar{a}bc$
1	0	0	0	
1	0	1	0	
1	1	0	1	$ab\bar{c}$
1	1	1	1	abc

c) $a(\bar{b}+c) + \overline{\bar{c}d} \equiv (\overline{\overline{a(\bar{b}+c)}})cd$

$(\bar{a} + (\bar{b}+c))cd \equiv (\bar{a}+\bar{b}+c)cd$

$\equiv \bar{a}cd + \bar{b}cd + cd \equiv cd$

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d) $(\bar{b}\bar{c}+a)\,\bar{e}f$

$\overline{((\bar{b}\bar{c}+a)ae)(adf)(\overline{(\bar{b}c)f(\bar{e}f)})} + ((\bar{b}c)f(\bar{e}f))$

$((\bar{b}\bar{c}+a)ae) + (adf) + ((\bar{b}c)f(\bar{e}f)) + (bc+\bar{f}+ef)$

$(\bar{b}+\bar{c}+a)ae + adf + (\bar{b}+\bar{c})f(\bar{e}+\bar{f}) + bc + \bar{f} + ef$

$\bar{b}ae + \bar{c}ae + ae + adf + \bar{b}f\bar{e} + \bar{c}f\bar{e} + bc + \bar{f} + ef$

$ac(\bar{b}+\bar{c}+1) + f\bar{e}(\bar{b}+\bar{c}) + adf + bc + \bar{f} + ef$

$ac + ef + adf + bc + \bar{f} + f\bar{b}\bar{e} + f\bar{c}\bar{e}$

$ac + \bar{f} + e + ad + \bar{b}\bar{e} + \bar{c}\bar{e} + bc$

$e + \bar{f} + ad + \bar{b} + \bar{c} + bc \equiv e + \bar{f} + ad + \bar{b} + \bar{c} + b \equiv ad + e + \bar{f} + \bar{c}$

LISTA 3

1. a)

$E=0$

$AB\backslash CD$	00	01	11	10
00	1		1	1
01			1	1
11				
10	1		1	1

$\bar{a}c$ ←

$b\bar{c}\bar{a}e$

$b\bar{c}\bar{a}$

$ab\bar{c}$

$E=1$

$AB\backslash CD$	00	01	11	10
00	1		1	1
01	(1)		1	1
11	(1)		(1)	
10	1		1	1

$\boxed{\bar{e}c + ab\bar{c}c + b\bar{c}\bar{a} + ab\bar{c}\bar{a}e}$

c) $EF=00$

$AB\backslash CD$	00	01	11	10
00	1			
01	1			
11	1	(1)		
10		(1)		

$EF=01$

$AB\backslash CD$	00	01	11	10
00	1			
01	1			
11	1	(1)		
10		(1)		

$\boxed{\bar{c}d\bar{e} + ab\bar{c}\bar{e}d\bar{c} + ab\bar{c}\bar{e}dc}$

$EF=11$

$AB\backslash CD$	00	01	11	10
00				
01				
11				
10	1			

$EF=10$

$AB\backslash CD$	00	01	11	10
00				
01				
11				
10	1			

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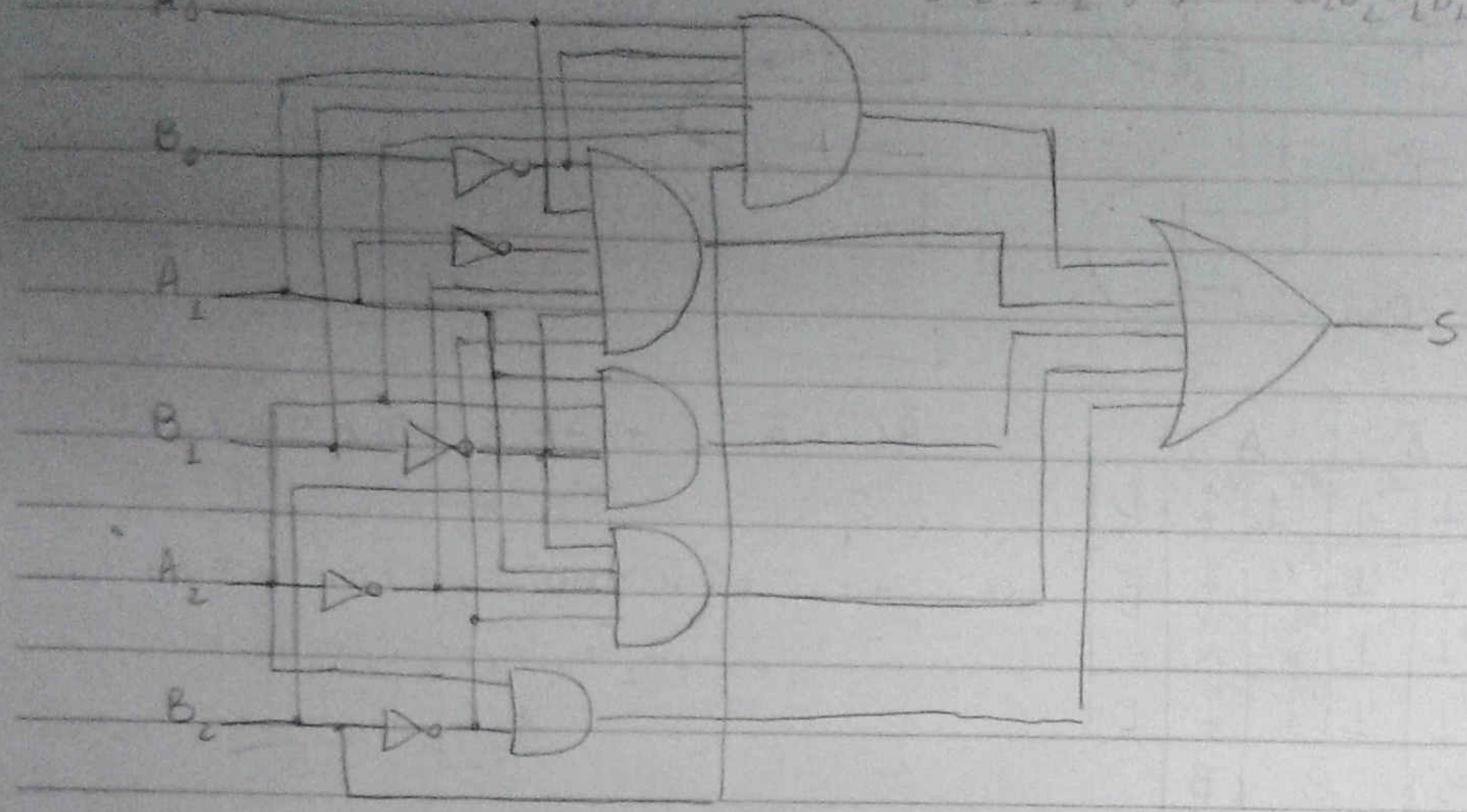
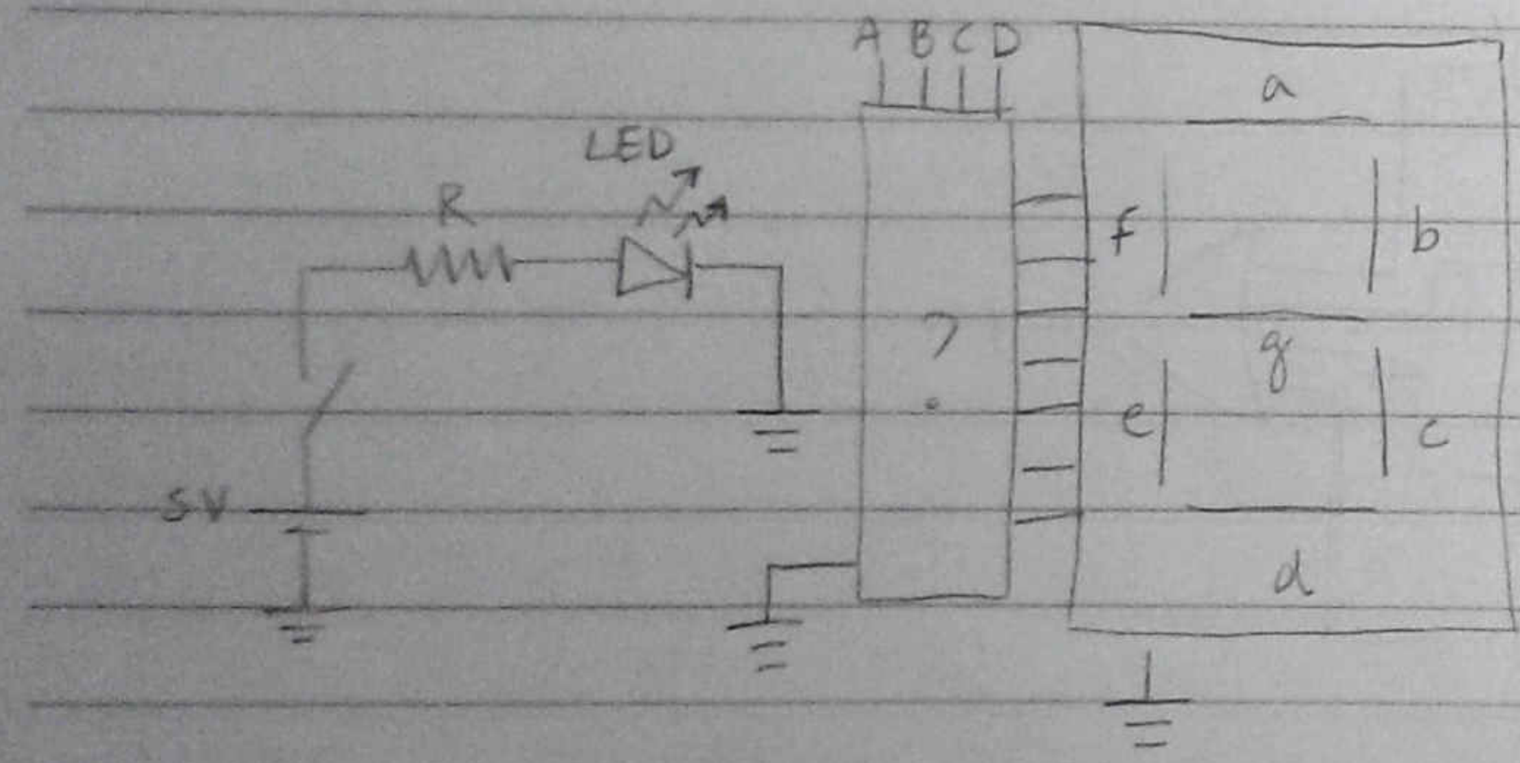
$2^3\ a_2\bar{b}_2 + \bar{a}_2\bar{b}_2 a_1\bar{b}_1 + a_2 b_2 a_1\bar{b}_1 + \bar{a}_2\bar{b}_2\bar{a}_1\bar{b}_1 a_0\bar{b}_0 + a_2 b_2 a_1 b_1 a_0\bar{b}_0$

$+ \bar{a}_2\bar{b}_2 a_1 b_1 a_0\bar{b}_0 + a_2 b_2 \bar{a}_1\bar{b}_1 a_0\bar{b}_0$





	A B C D	a b c d e f g
m_0	0 0 0 0	1 1 1 1 1 1 0
m_1	0 0 0 1	0 1 1 0 0 0 0
m_2	0 0 1 0	1 1 0 1 1 0 1
m_3	0 0 1 1	1 1 1 1 0 0 1
m_4	0 1 0 0	0 1 1 0 0 1 1
m_5	0 1 0 1	1 0 1 1 0 1 1
m_6	0 1 1 0	1 0 1 1 1 1 1
m_7	0 1 1 1	1 1 1 0 0 0 0
m_8	1 0 0 0	1 1 1 1 1 1 1
m_9	1 0 0 1	1 1 1 1 0 1 1

$f_a(ABCD) = \sum m_0 m_2 m_3 m_5 m_6 m_7 m_8 m_9$

$f_b(ABCD) = \sum m_0 m_1 m_2 m_3 m_4 m_7 m_8 m_9$

$f_c(ABCD) = \sum m_0 m_1 m_3 m_4 m_5 m_6 m_7 m_8 m_9$

$f_d(ABCD) = \sum m_0 m_2 m_3 m_5 m_6 m_7 m_8 m_9$

$f_e(ABCD) = \sum m_0 m_2 m_6 m_8$

$f_f(ABCD) = \sum m_0 m_4 m_5 m_6 m_8 m_9$

$f_g(ABCD) = \sum m_2 m_3 m_4 m_5 m_6 m_8 m_9$

$f_e(ABCD) = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}BC\bar{D} + A\bar{B}\bar{C}\bar{D} \equiv \bar{B}\bar{C}\bar{D}(\bar{A}+A) + \bar{A}C\bar{D}(\bar{B}+B)$

$\equiv \bar{B}\bar{C}\bar{D} + \bar{A}C\bar{D}$

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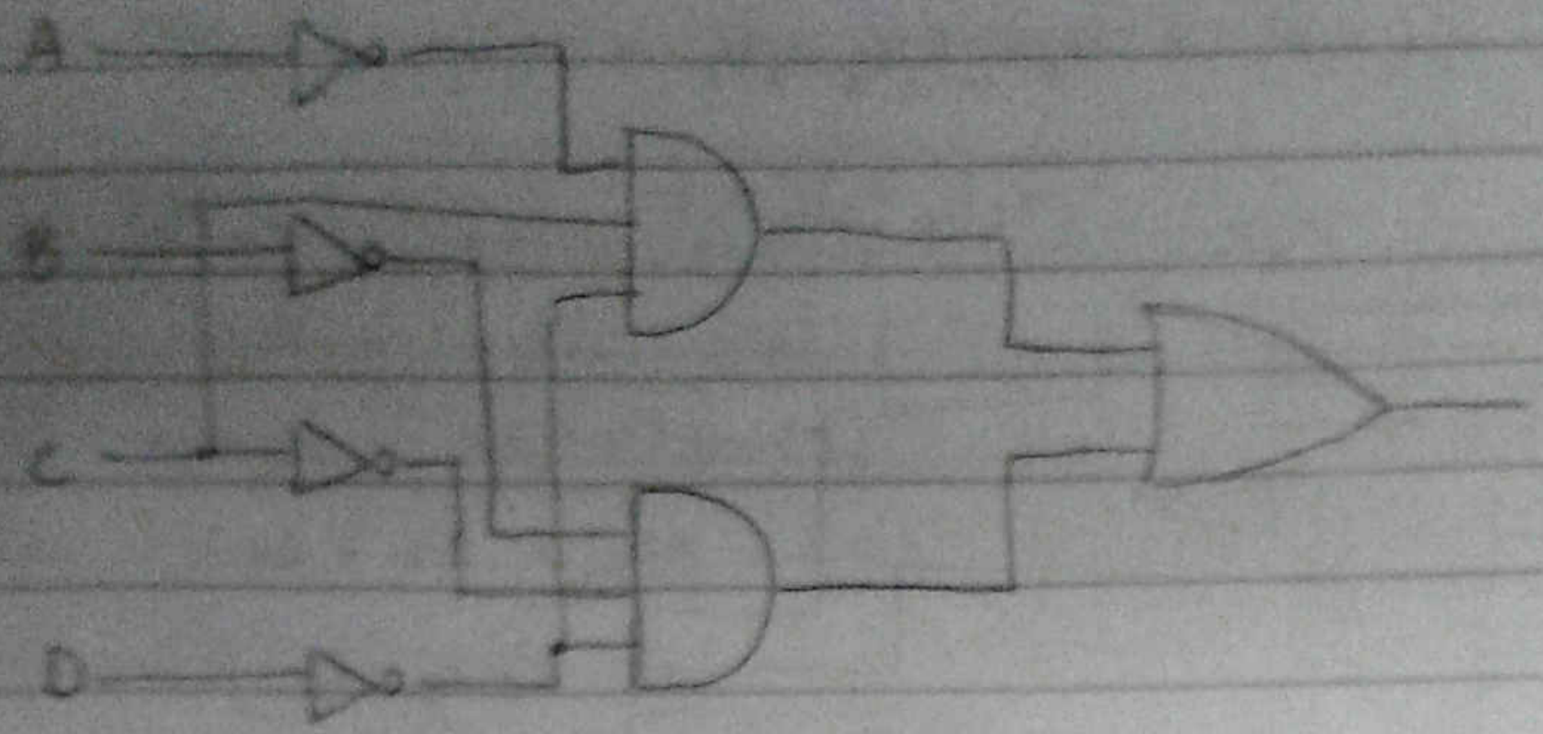


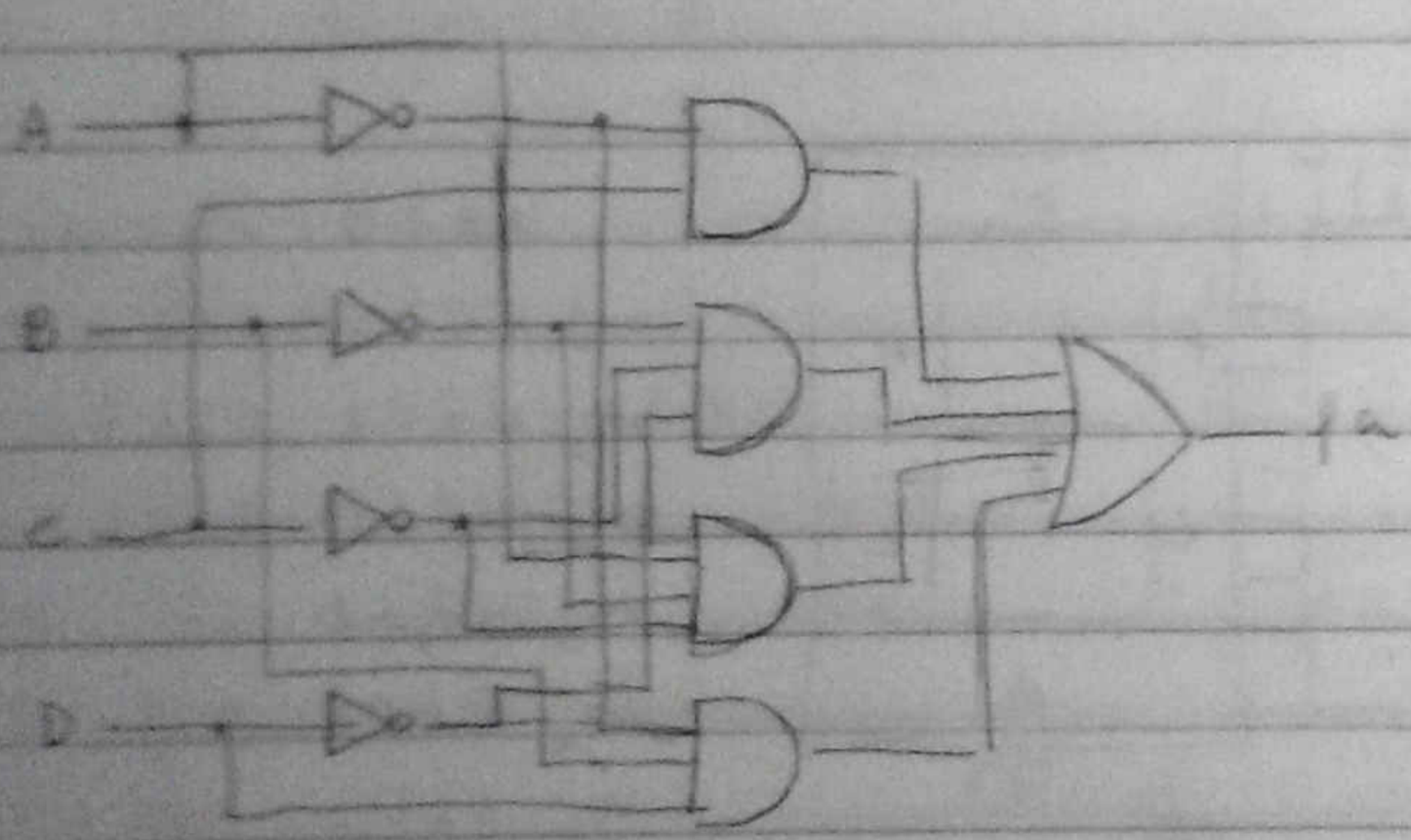
	$\bar{A}$		A		
$\bar{C}$	1	0	1	*	D
	0	1	1	*	$\bar{D}$
C	1	1	*	*	
	1	1	*	*	D
	B	$\bar{B}$		B	

$\bar{A}C + \bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C} + \bar{A}BD = f_a$

$A + C + \bar{B}\bar{D} + BD = f_a \ (com\ * = 1)$

$\Sigma m_0 m_1 m_2 m_5 m_6 m_7 m_8 m_9 +$

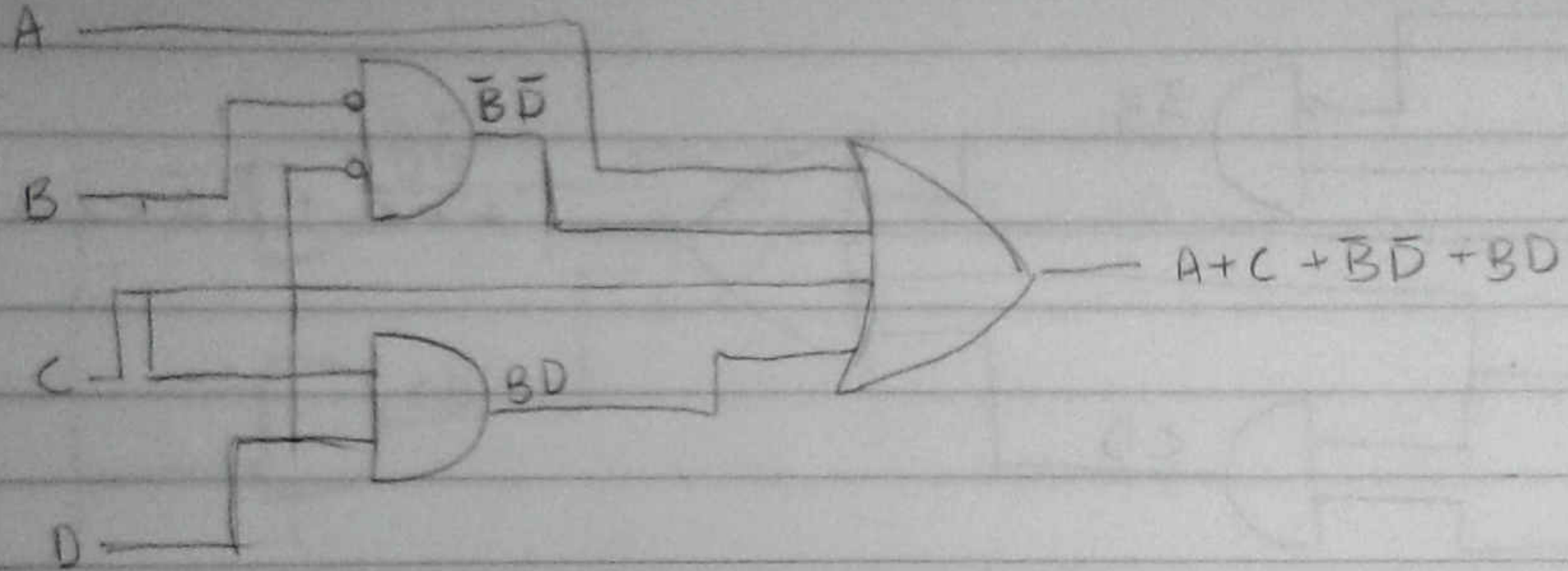
$d(m_{10} m_{11} m_{12} m_{13} m_{14} m_{15})$



$f_a = \sum m_0 m_1 m_2 m_3 m_4 m_5 m_6 m_7 m_8 m_9 + d(m_{10} m_{11} m_{12} m_{13} m_{14} m_{15})$

	$\bar{A}$		A		
$\bar{C}$	1	1	1	*	D
	1	1	1	*	$\bar{D}$
C	1	1	*	*	
	1	1	*	*	D
	B	$\bar{B}$		B	

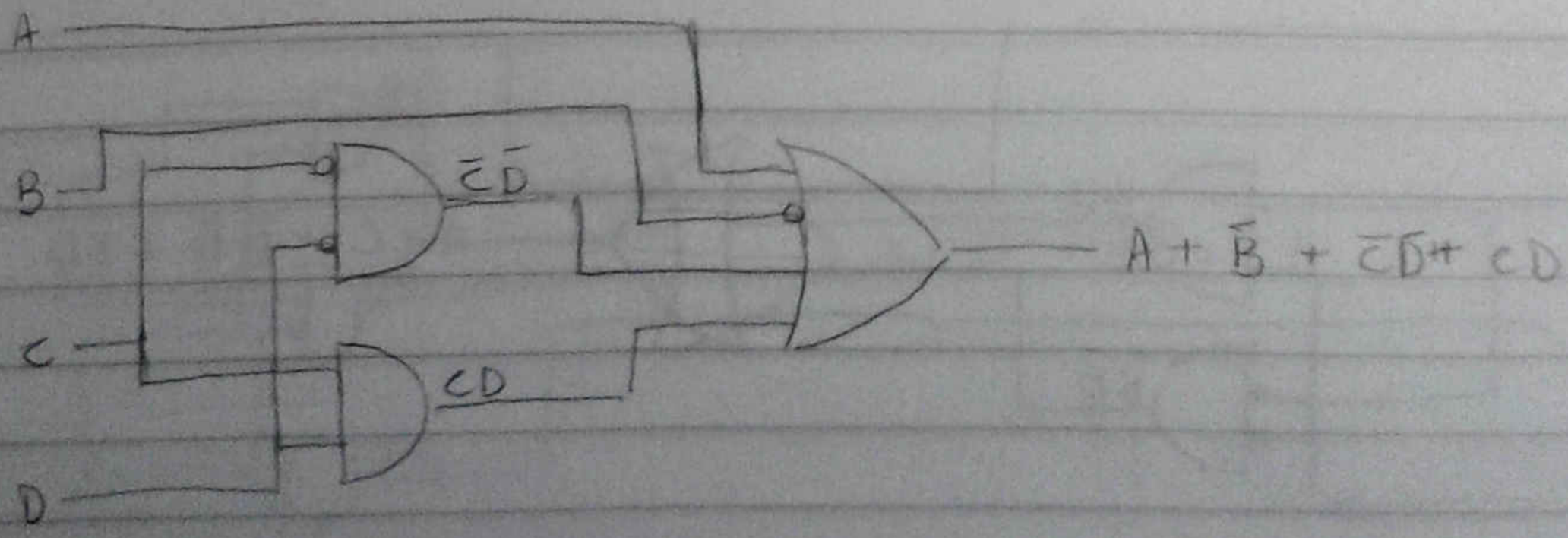
$f_a = A + C + \bar{B}\bar{D} + BD$



$f_b = \sum m_0 m_1 m_2 m_3 m_4 m_7 m_8 m_9 + d(m_{10} m_{11} m_{12} m_{13} m_{14} m_{15})$

	$\bar{A}$		A		
$\bar{C}$	0	1	1	*	D
	1	1	1	*	$\bar{D}$
C	0	1	*	*	
	1	1	*	*	D
	B	$\bar{B}$		B	

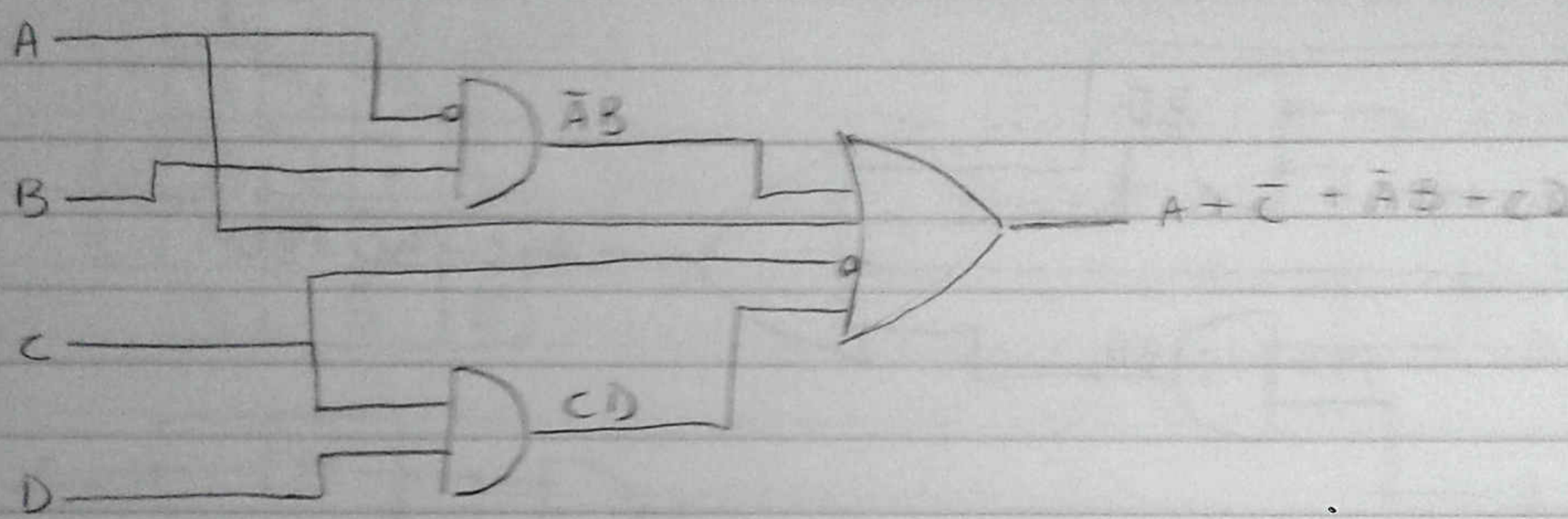
$f_b = A + \bar{B} + \bar{C}\bar{D} + CD$



$f_c = \sum m_0 m_1 m_3 m_4 m_5 m_6 m_7 m_8 m_9 + d(m_{10}, m_{11}, m_{12}, m_{13}, m_{14}, m_{15})$

	$\bar{A}$		A		
$\bar{C}$	1	1	1	x	D
	1	1	1	x	$\bar{D}$
C	1	0	x	x	
	1	1	x	x	D
	B	$\bar{B}$		B	

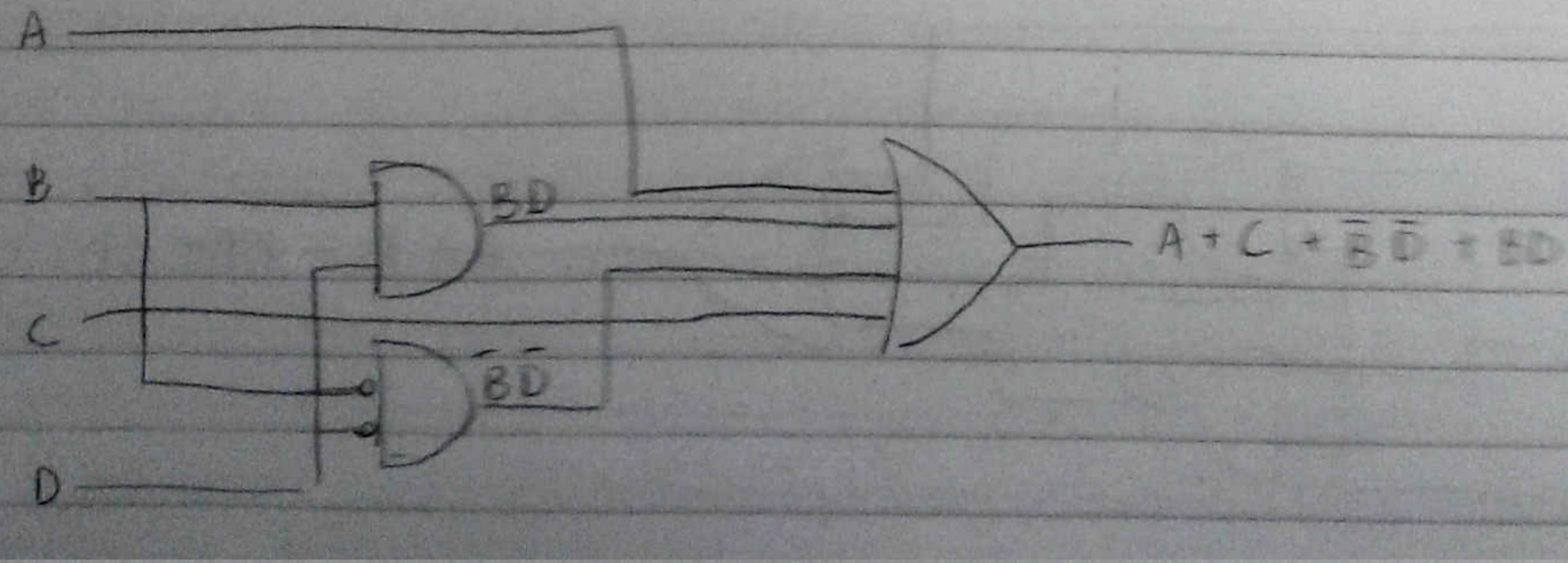
$f_c = \bar{C} + A + \bar{A}B + CD$



$f_d = \sum m_0 m_2 m_3 m_5 m_6 m_7 m_8 m_9 + d(m_{10} m_{11} m_{12} m_{13} m_{14} m_{15})$

	$\bar{A}$		A		
$\bar{C}$	1	0	1	x	D
	0	1	1	x	$\bar{D}$
C	1	1	x	x	
	1	1	x	x	D
	B	$\bar{B}$		B	

$f_d = A + C + \bar{B}\bar{D} + BD$



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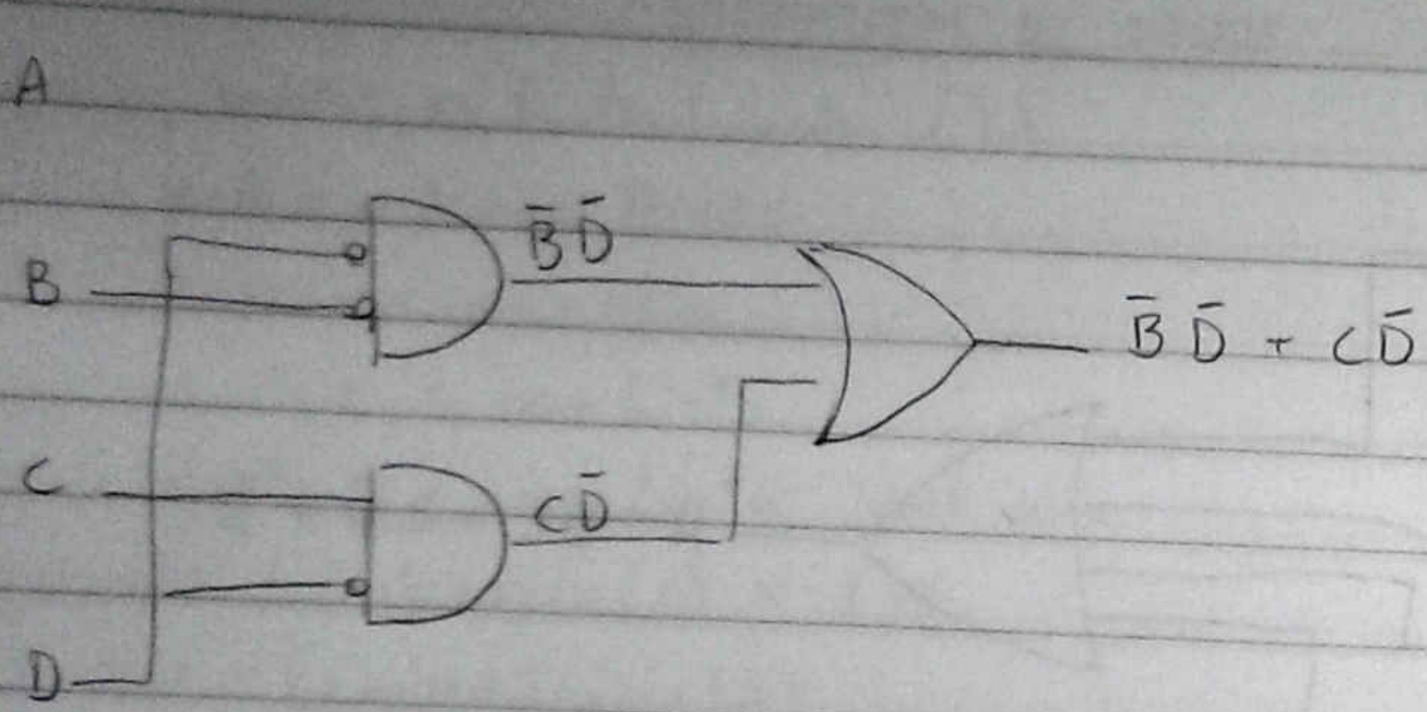
$fe = \sum m_0 m_2 m_6 m_8 + d(m_{10} m_{11} m_{12} m_{13} m_{14} m_{15})$

	$\bar{A}$		A		
$\bar{C}$	0	0	0	*	D
	0	1	1	*	$\bar{D}$
C	1	1	*	*	
	0	0	*	*	D
	B	$\bar{B}$		B	

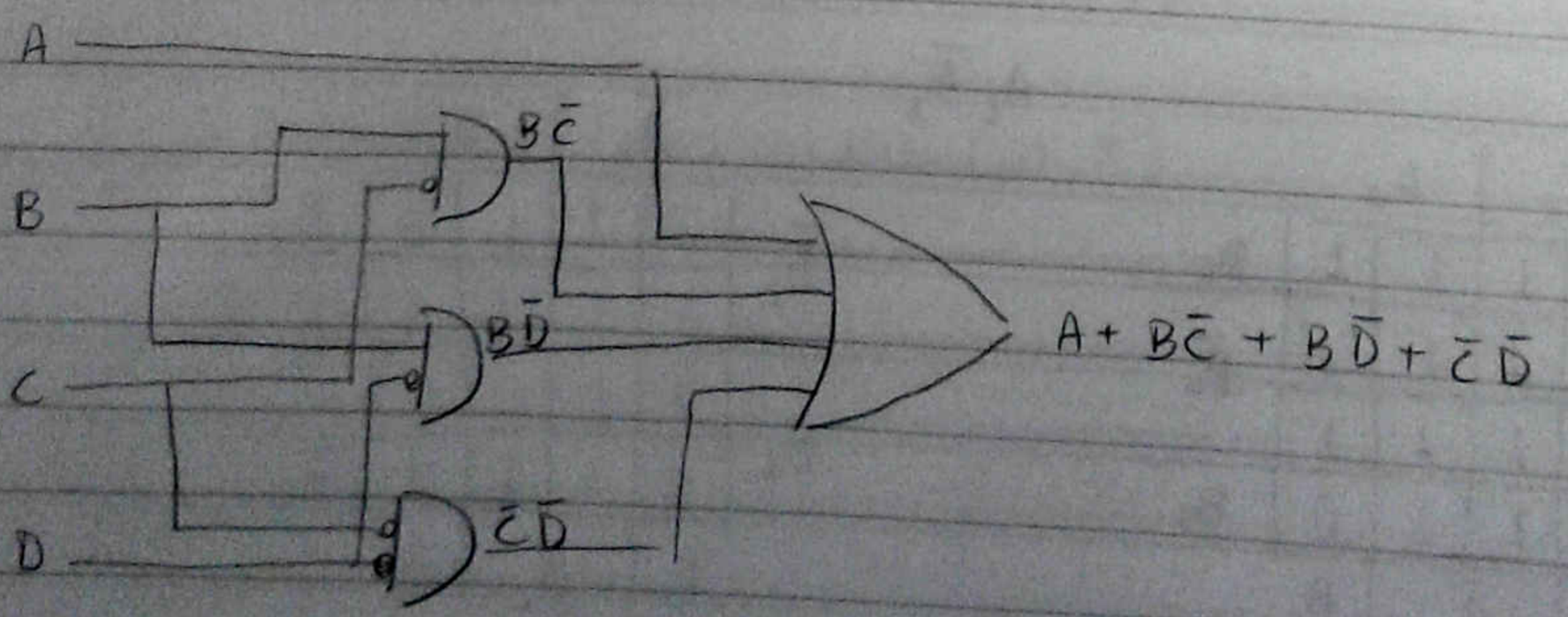
$fe = \bar{B}\bar{D} + C\bar{D}$



$ff = \sum m_0 m_4 m_5 m_6 m_8 m_9 + d(m_{10} m_{11} m_{12} m_{13} m_{14} m_{15})$

	$\bar{A}$		A		
$\bar{C}$	1	0	1	*	D
	1	1	1	*	$\bar{D}$
C	1	0	*	*	
	0	0	*	*	D
	B	$\bar{B}$		B	

$ff = A + B\bar{C} + B\bar{D} + \bar{C}\bar{D}$



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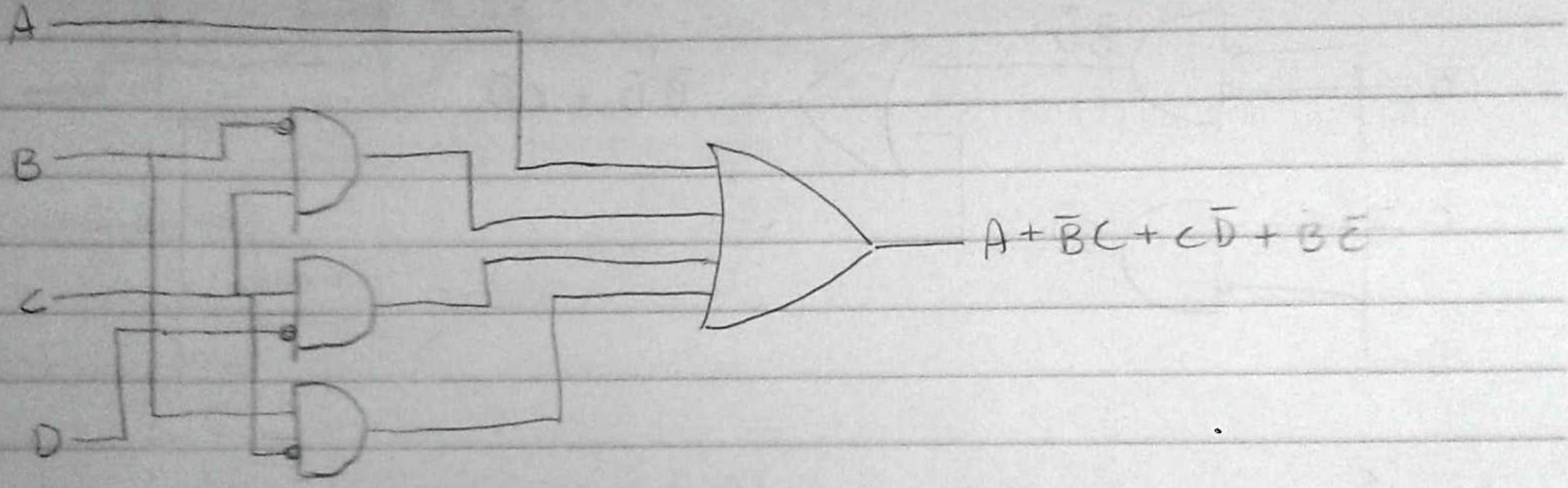
$fg = \Sigma m_2 m_3 m_4 m_5 m_6 m_8 m_9 + d(m_{10} m_{11} m_{12} m_{13} m_{14} m_{15})$

	$\bar{A}$		A		
$\bar{C}$	1	0	1	*	D
	1	0	1	*	$\bar{D}$
C	1	1	*	*	
	0	1	*	*	D
	B	$\bar{B}$		B	

$fg = A + \bar{B}C + C\bar{D} + B\bar{C}$



2) $\bar{A}_2 \bar{A}_1$

	$\bar{A}_0$		A_0		
$\bar{B}_1$	0	0	0	0	B_0
	0	0	1	0	$\bar{B}_0$
B_1	0	0	0	0	
	0	0	0	0	B_2
	B_2	$\bar{B}_2$		B_2	

$\bar{A}_2 A_1$

	$\bar{A}_0$		A_0		
$\bar{B}_1$	0	1	1	0	B_0
	0	1	1	0	$\bar{B}_0$
B_1	0	0	1	0	
	0	0	0	0	B_2
	B_2	$\bar{B}_2$		B_2	

$A_2 A_1$

	$\bar{A}_0$		A_0		
$\bar{B}_1$	1	1	1	1	B_0
	1	1	1	1	$\bar{B}_0$
B_1	0	1	1	1	
	0	1	1	0	B_0
	B_2	$\bar{B}_2$		B_2	

$A_2 \bar{A}_1$

	$\bar{A}_0$		A_0		
$\bar{B}_1$	0	1	1	0	B_0
	0	1	1	1	$\bar{B}_0$
B_1	0	1	1	0	
	0	1	1	0	B_0
	B_2	$\bar{B}_2$		B_2	

$A_2 A_1 A_0 \bar{B}_0 +$

$A_2 A_1 \bar{B}_1 + A_0 \bar{B}_0 \bar{B}_1 \bar{B}_2 + A_1 \bar{B}_2 \bar{B}_1 + A_2 \bar{B}_2 + A_1 A_0 \bar{B}_2 B_1 \bar{B}_0 + A_2 A_0 B_2 \bar{B}_1 \bar{B}_0$

24 / 03 / 16

4. a)

010 — 01-

100

011 — 10-

101

$\bar{X}Y + X\bar{Y}$

d)

0000 — 000- *

0-00 — 0-0-

-000 — 00

0001

0100

1000

0-01

10-0 *

-100

0101

1010

1100

110- *

1101

1111

12-1 *

		0	1	4	5	12	13	8	10	15
→ 0,1,4,5	0-0-	X	X	X	X					
0,4,8,12	--00	X		X		X		X		
0,1	000-	X	X							
8,10	10-0							X	X	
→ 12,13	110-					X	X			
	11-1						X			X

$\bar{A}C + AB\bar{C}$