ITI1100 HW1

1) $2^0\ 2^{-1}\ 2^{-2}\ 2^{-3}\ 2^{-4}\ 2^{-5}$

1.10010

Dec: $= 2^0 + \frac{1}{2} + \frac{1}{8}$

$= 1.625$

Hex: 0001.1001

$= 1.9$

$2^2\ 2^1\ 2^0\ 2^{-1}\ 2^{-2}\ 2^{-3}$

110.010

Dec: $= 2^2 + 2 + 2^{-2}$

$= 6.25$

Hex: 0110.0100

$= 6.4$

The number on the right is larger because the decimal point is shifted to the right. This means that the decimal value of the number is increased by a factor of 2^2, which means that 110.010 is 4x larger than 1.10010.

2)

a) $10011 - 10001$

2's complement: 01111

$10011 + 01111 = 100010$

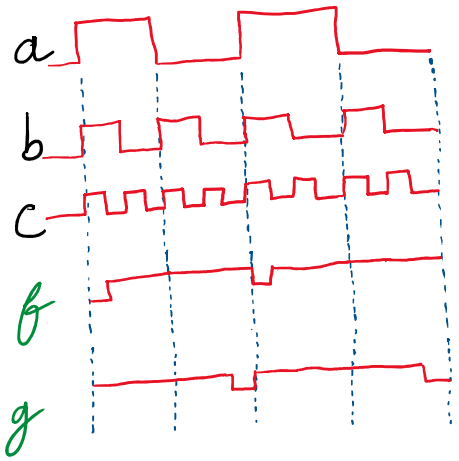
b) $100010 - 100011$

2's complement: 011101

$100010 + 011101 = 111111$

2's complement of -000001

3)



4)

a) $\overline{((\overline{A}.B + C.D)\cdot\overline{E})} + E$

$= ((\overline{\overline{A}.B + C.D})\cdot\overline{E})\cdot\overline{E}$

$= ((\overline{\overline{A}.B}\cdot\overline{C.D}) + E)\cdot\overline{E}$

$= ((\overline{\overline{A}B}\cdot\overline{CD}) + E)\cdot\overline{E}$

$= (((A+\overline{B})\cdot(C+D)) + E)\cdot\overline{E}$

b) $\overline{(\overline{x} + y + \overline{z})\cdot(x+\overline{y})\cdot(x+z)}$

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

$= x\overline{y}z + \overline{x}y + \overline{x}\overline{z}$

5.

$T_1 = \bar{A}\bar{B} + \bar{A}\bar{C} = \bar{A}(\bar{B}+\bar{C})$

A \ BC	00	01	11	10
0	1	1	0	1
1	0	0	0	0

$T_2 = A + BC$

A \ BC	00	01	11	10
0	0	0	1	0
1	1	1	1	1

6. $F(A,B,C,D) = \bar{B}D + \bar{A}D + BD$

A	B	C	D	B'D+A'D+BD
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

$F_{min} = \sum(1,3,5,7,9,11,13,15)$

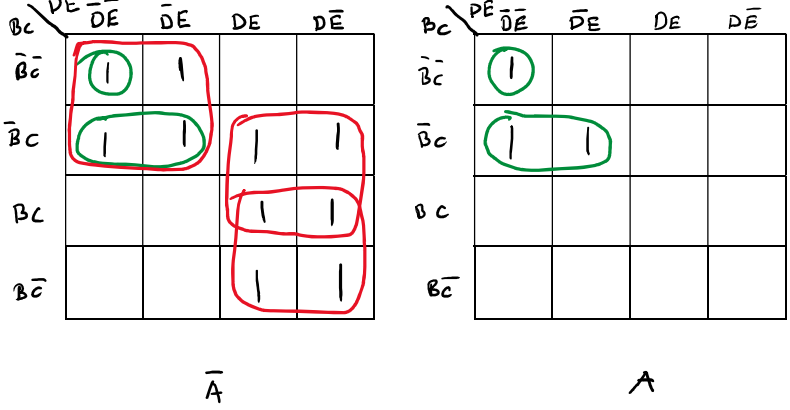
$F_{max} = \prod(0,2,4,6,8,10,12,14)$

7. $F = \bar{A}B + \bar{A}CD + \bar{B}CD + B\bar{C}\bar{D}$

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	1	3 1	2
$\bar{A}B$	4 1	5 1	7 1	6 1
$A\bar{B}$	12 1	13	15	14
$A\bar{B}$	8	9	11 1	10

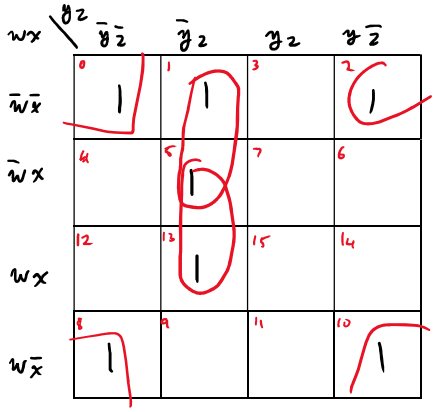
$F_{min} = \sum(3,4,5,6,7,11,12)$

8. $F(A,B,C,D,E) = \bar{A}\bar{B}C\bar{E} + \bar{B}C\bar{D}\bar{E} + \bar{A}\bar{B}\bar{D} + \bar{B}C\bar{D} + \bar{A}CD + \bar{A}BD$



$F(A,B,C,D,E) = \bar{A}\bar{B}\bar{D} + \bar{A}CD + \bar{A}BD + \bar{B}C\bar{D} + \bar{B}\bar{C}\bar{D}\bar{E}$

9. $F(w,x,y,z) = \sum(0,1,2,5,8,10,13)$



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

10. $F(A,B,C,D) = (A+\bar{C}+\bar{D})(\bar{A}+\bar{B}+\bar{D})(\bar{A}+B+\bar{D})(\bar{A}+B+C)$

$= \overline{(A+\bar{C}+\bar{D}) + (\bar{A}+\bar{B}+\bar{D}) + (\bar{A}+B+\bar{D}) + (\bar{A}+B+C)}$

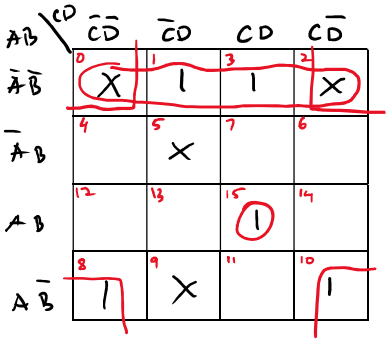
$= \overline{\bar{A}CD + AB\bar{D} + A\bar{B}\bar{D} + A\bar{B}\bar{C}}$

$= \overline{AD + \bar{A}CD + A\bar{B}\bar{C}}$

POS
$= (\bar{A}\bar{D})(\bar{A}\bar{C}D)(A\bar{B}\bar{C})$
$= (\bar{A}+\bar{D})(A+\bar{C}+\bar{D})(\bar{A}+B+C)$

$= AD + \bar{A}CD + A\bar{B}\bar{C}$] SOP

11. $F(A,B,C,D) = \sum_m(1,3,8,10,15) + \sum_d(0,2,5,9)$

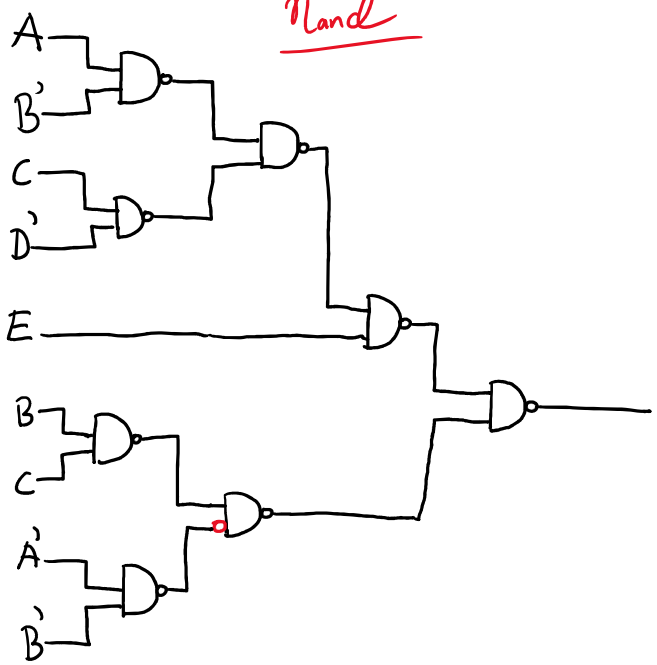


$F(A,B,C,D) = \bar{A}\bar{B} + \bar{B}\bar{D} + ABCD$

$F(A,B,C,D) = \sum_m(0,1,2,3,8,10,15)$

12. $(AB' + CD')E + BC(A+B)$

Nand



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