Homework 1. EC605

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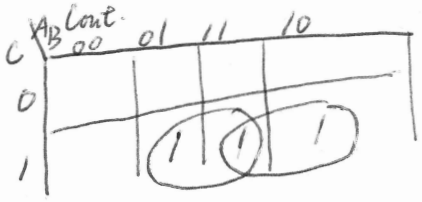
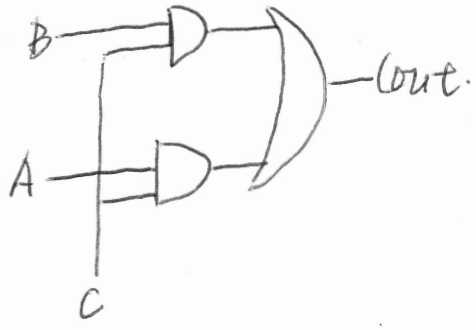
1. a) $Cout = A'BC + AB'C + ABC$

b)



$Cout = BC + AC$

c).



2. $Y = \overline{A+B} + C$

$Z = \overline{C} \oplus BD$

3. a) $(25)_{10}$

$= (0001\,1001)_{2's\,com}$

$= (0X19)_{16}$

$25 - 16 = 9$, $9 - 8 = 1$

$16\ 1$, $8\ 1$, $4\ 0$, $2\ 0$, $1\ 1$

b) $(-62)_{10}$

$= 1100\,0001 + 1$

$= (1100\,0010)_{2's\,com}$

$= (0XC2)_{16}$

$62 - 32 = 30$, $30 - 16 = 14$, $14 - 8 = 6$, $6 - 4 = 2$, $2 - 2 = 0$

$64\ 0$, $32\ 1$, $16\ 1$, $8\ 1$, $4\ 1$, $2\ 1$, $1\ 0$

$(62)_{10} = 0011\,1110$

c) $(127)_{10}$

$= (0111\,1111)_{2's\,com}$

$= (0X7F)_{16}$

$127 - 64 = 63$, $63 - 32 = 31$, $31 - 16 = 15$, $15 - 8 = 7$, $7 - 4 = 3$, $3 - 2 = 1$, $1 - 1 = 0$

$64\ 1$, $32\ 1$, $16\ 1$, $8\ 1$, $4\ 1$, $2\ 1$, $1\ 1$

4. a) $(6AFA)_{16}$

$= 6\times16^3 + 10\times16^2 + 15\times16^1 + 10\times16^0$

$= (27386)_{10}$

b) $(0010\ 0001)_{2's\ com}$

$= 1\times2^5 + 1\times2^0$

$= (33)_{10}$

c) $(1011\ 1001)_{2's\ com} = -1\times2^7 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 1\times2^0 = (-71)_{10}$

5. a) $(63.25)_{10} = (0011\ 1111.01)_2$

$(0011\ 1111.01)_2 = 1.111101\times2^5$

Sign is +, which = 0.

Exponent = 5 + 127 = 132 = 10000100

Mantissa = 1.111101 0000 0000 0000 0000

31	30 ... 23	22 ... 0
0	100 0010	0 111 1101 0000 0000 0000 0000

Hex: 0X427D0000

b) 0XC1300000

31	30 ... 23	22 ... 0
1	100 0001	0 011 0000 0000 0000 0000 0000

sign = 1, which is negative

Exponent = (128+2) − 127 = 3.

Mantissa = 1.011

$-1.011\times2^3 = -1011 = -(1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0) = -(8+0+2+1) = -11$

b. a) 00110110 54
$+\ 01000101$ $+69$
01111011 123

No overflow occurs.

b) $\overset{111}{0}1110101$ 117
$+\ 11011110$ $+-34$
$\perp\ 01001011$ 83

No overflow occurs.

c) $10011101 = -1\times2^7+2^4+2^3+2^2+1\times2^0 = -99$
$+\ 10000001 = -127$
$\perp\ 00011110 = 30$

$30 \neq -226$

$\therefore$ overflow occurs.

-99
$+-127$
-226

d) We should ~~extend~~ make the sign extend both integers to twice as many bits.

But the sign is 0.

so we can just multiply

$$\begin{array}{r} 10110 1 \\ \times\quad 101 \\ \hline 10110 1 \\ 00 0000 \\ 10110 1 \\ \hline 1110000 1 \end{array}$$

45

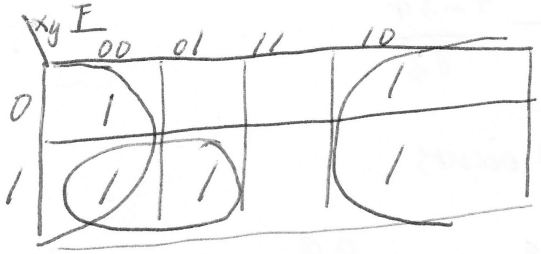
5

-31

$45\times5 \neq -31$

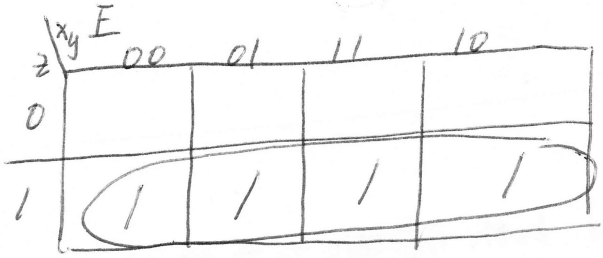
$\therefore$ overflow occurs.

7. a) $F(x,y,z) = x'y'z' + x'y'z + x'yz + xy'z' + xy'z$



Simplified expression: $F(x,y,z) = y' + x'z$

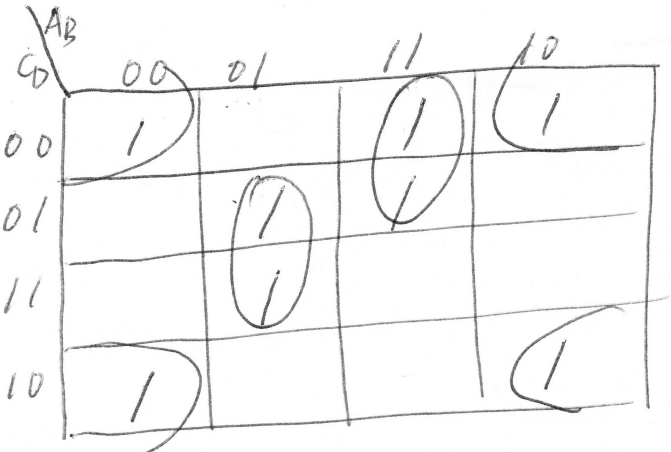
b) $F(x,y,z) = x'y'z + x'yz + xy'z + xyz$



Simplified expression:

$F(x,y,z) = z$

c) $F(A,B,C,D) = A'B'C'D' + AC'D' + B'CD' + A'BCD + BC'D$



Simplified expression:

$F(A,B,C,D) = B'D' + A'BD + ABC'$

d) $F(w,x,y,z) = x'z + w'xy' + wx'y + wxy'$

Simplified expression:

$F(w,x,y,z) = xy' + x'z + wx'yz'$