Ass 2 – Solutions

1. Let $f(a,b,c) = ab + c(a+b) = z$

$$\overline{f(a,b,c)} = \overline{ab + c(a+b)} = (\bar{a}+\bar{b})\cdot\{\bar{c} + \bar{a}\bar{b}\}$$

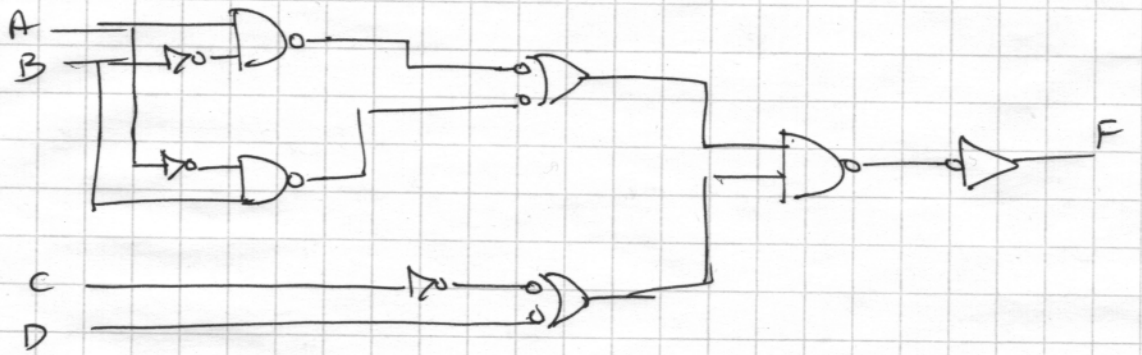
$$= \bar{a}\bar{c} + \bar{a}\bar{b} + \bar{b}\bar{c} = \bar{a}\bar{b} + \bar{c}(\bar{a}+\bar{b})$$

$$= f(\bar{a},\bar{b},\bar{c})$$

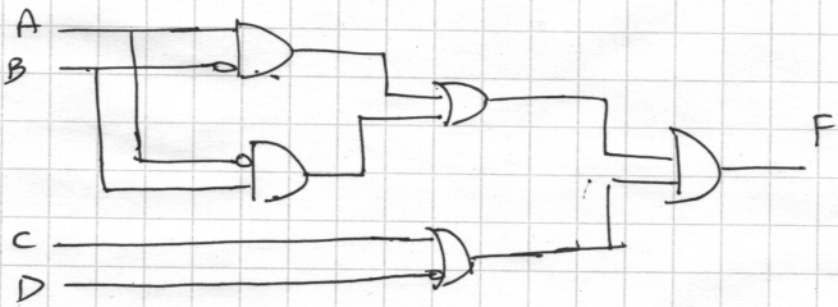
$\therefore$ z satisfies $\overline{f(a,b,c)} = f(\bar{a},\bar{b},\bar{c})$

$\Rightarrow$ z is a self-dual function.

2. Selecting the second and fourth layer and changing the ~~nand~~ gates to unconventional ones, we have



which can be redrawn as



3.

a) $(11001.001)_2 = 1\times2^4 + 1\times2^3 + 2^0 + 1\times2^{-3}$

$= (25.125)_{10}$.

b) $(1001110.11)_2 = (116.6)_8$

c) $(1001110.11)_2 = (4E.C)_{16}$

d) $(125.86)_{10} = (1111101.110)_2$

4.

A	1	1	1	0	0	1	0	0
+B	1	1	0	0	0	1	1	0
	①	1	0	1	0	1	0	1	0

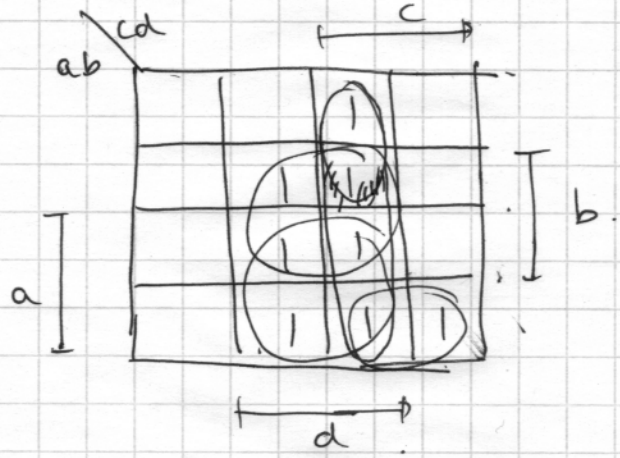
discard.

−A	0	0	0	1	1	1	0	0
+B	1	1	0	0	0	1	1	0
	1	1	1	0	0	0	1	0

−A	0	0	0	1	1	1	0	0
−B	0	0	1	1	1	0	1	0
	0	1	0	1	0	1	1	0

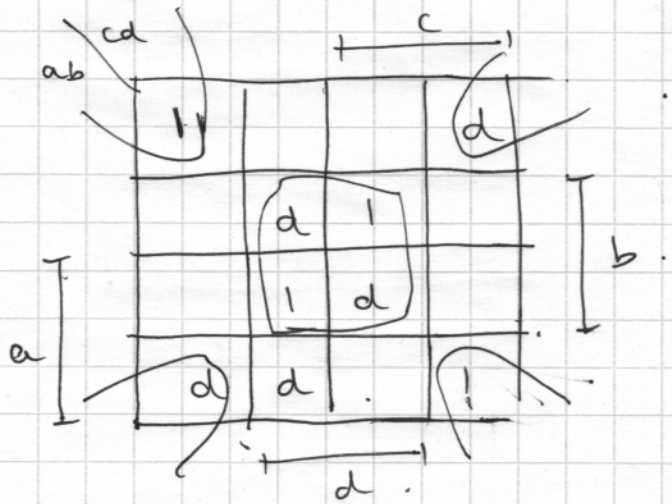
no overflow in all three cases.

5.



$$bd + ad + \cancel{c\bar{a}\bar{d}} + ac\bar{b}$$

6.



$$bd + \bar{b}\bar{d} = \overline{b \oplus d}$$