Assignment 1, ELEC-2607

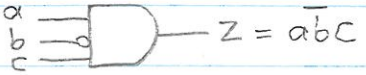
Winter 2015

1.

a b c	b+c	a(b+c)	$a(b+c)$	$\bar{b}\bar{c}$	$\bar{a}+\bar{b}\bar{c}$
0 0 0	0	0	1	1	1
0 0 1	1	0	1	0	1
0 1 0	1	0	1	0	1
0 1 1	1	0	1	0	1
1 0 0	0	0	1	1	1
1 0 1	1	1	0	0	0
1 1 0	1	1	0	0	0
1 1 1	1	1	0	0	0

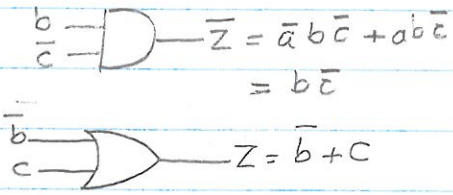
$=$

2.



(a)

(b)



3. a) $B\bar{A} + \underbrace{(E+F)BC + BC}_{BC} + CA = B\bar{A} + BC + CA$

$= \bar{A}B + AC$ Consensus

b) $(X+W)(Y+Z) + XYW = [XYW + (X+W)][XYW + (Y+Z)]$ D2

$= [X(YW+1) + W(XY+1)][Y(XW+1) + Z]$

$= (X+W)(Y+Z)$

OR

$(X+W)(Y+Z) + XYW = XY + XZ + WY + WZ + XYW + XYW$

$= XY(W+1) + WY(X+1) + Z(X+W)$

$= XY + WY + Z(X+W)$

$= Y(W+X) + Z(X+W)$

$= (W+X)(Y+Z)$

c) $X\bar{Y} + XZ + \bar{Z}Y = X\bar{Y} + XZ + \bar{Z}Y + \underline{XY}$ (Consensus)

$= X(\bar{Y} + Y) + XZ + \bar{Z}Y$

$= X + XZ + \bar{Z}Y$

$= X + \bar{Z}Y$

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

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

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

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

$=$ LHS

5. $F = \overline{a + \overline{(d+a)}cg} = \overline{a + (\bar{a}\bar{d}cg)}$

$= \bar{a} \cdot (a + d + \bar{c} + \bar{g})$

$= \bar{a}d + \bar{a}\bar{c} + \bar{a}\bar{g}$

6. $Z = ab + c(a+b) = f(a,b,c)$

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

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

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

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

$Z = f(a,b,c)$

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

$\therefore$ it is self-dual