CpE 111 HW#2 Solutions.

1. Given 3.1

From Table 3.1 ↓

a. $XY + X\bar{Y} + \bar{X}\bar{Y} = X(Y+\bar{Y}) + \bar{X}\bar{Y}$ P4b

$= X \cdot 1 + \bar{X}\bar{Y}$ P5b

$= X + \bar{X}\bar{Y}$ P2b

$= X + \bar{Y}$ T7a

b. $\overline{(\bar{X}\bar{Z} + \bar{X}Y + \bar{Y}Z + XY)} = \overline{(\bar{X}Z + \bar{X}\bar{Z} + YX + Y\bar{X})}$ P3a, P3b

$= \overline{[\bar{X}(Z+\bar{Z}) + Y(X+\bar{X})]}$ P4b

$= \overline{(\bar{X} \cdot 1 + Y \cdot 1)}$ P5b

$= \overline{(\bar{X} + Y)}$ P2b

$= \bar{\bar{X}} \cdot \bar{Y}$ T9a

$= X \cdot \bar{Y}$ T5

c. $(X+Y)\cdot(\bar{X}\bar{Z}+Z)\overline{(\bar{Y}+XZ)} = (X+Y)(Z+\bar{Z}\bar{X})\overline{(\bar{X}+XZ)}$ P3a, P3b

$= (X+Y)(Z+\bar{X})\overline{(\bar{X}+XZ)}$ T7a

$= (X+Y)(Z+\bar{X})Y(\bar{X}Z)$ T9a, T5

$= (X+Y)(Z+\bar{X})Y(\bar{X}+\bar{Z})$ T9b

$= (X+Y)(\bar{X}+Z)(\bar{X}+\bar{Z})Y$ P3a, P3b

$= (X+Y)(\bar{X}+Z\bar{Z})Y$ P4a

$= (X+Y)(\bar{X}+0)Y$ P5a

$= (X+Y)\cdot\bar{X}Y$ P2a

$= \bar{X}Y(X+Y)$ P2b

$= \bar{X}[Y(X+Y)]$ T8b

$= \bar{x}[y(y+x)]$ p3a

$= \bar{x}y$ T6b

2. Givone 3.5

a&b

XYZ	a	b
000	1	1
001	1	0
010	1	1
011	1	1
100	0	1
101	0	1
110	1	0
111	1	1

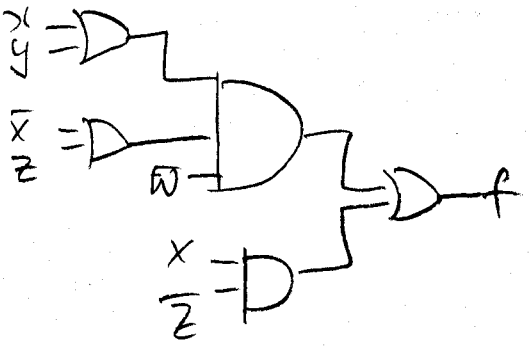
3. Givone 3.18

a. $f = \vee(w\bar{x}z + y)(w+z) + \bar{w}$

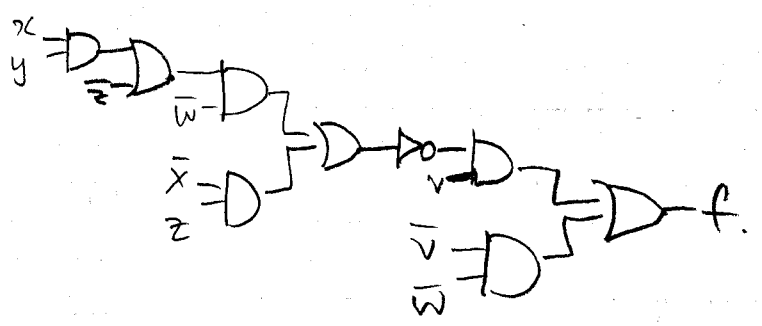
c. $f = [\overline{(w+\bar{x})(\bar{w}+y)}]z + (\bar{w}+y)\bar{z}$

4. Givone 3.19

a.



c.



5. $f = 1/0.5 \times 10^{-6} = 2\,MHz$

6. For 500 MHz $T_1 = 1/500 \times 10^6 = 2\,ns.$

For 600 MHz $T_2 = 1/600 \times 10^6 = 1.67\,ns$

% decrease $= \frac{2 - 1.67}{2} \times 100 = 16.5\,\%$

7. $W = \overline{A \cdot B} \cdot \overline{C \cdot D} = (\bar{A} + \bar{B}) \cdot (\bar{C} + \bar{D})$

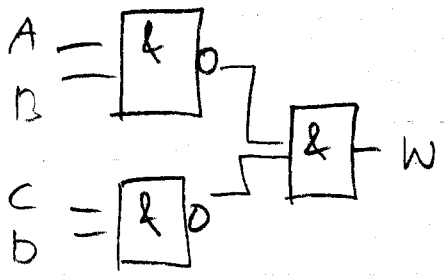
$= \overline{\overline{(\bar{A} + \bar{B}) \cdot (\bar{C} + \bar{D})}}$

$= \overline{(\bar{A} + \bar{B})} + \overline{(\bar{C} + \bar{D})}$ ∈ NOR only since $\bar{A} = \overline{A + A}$

8. $X = (\bar{a} + \bar{b}) \cdot C = \overline{a \cdot b} \cdot c$

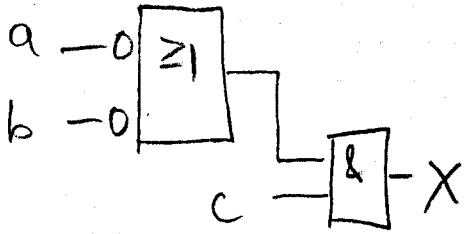
$= \overline{\overline{a \cdot b} \cdot c}$ ∈ NAND only since $\bar{A} = \overline{A \cdot A}$

9.



(★) note: NOR-only & NAND-only forms have different logic diagrams.

10.



11. $f = uv\bar{w} + uv$

$= uv\bar{w} + uv(w + \bar{w})$

$= uv\bar{w} + uvw + uv\bar{w}$

$= \underline{uv\bar{w} + uvw}$.

(★) note: Since CSOP is not covered in Ch2. this problem will not be graded. Instead, 10 pts will be given automatically.