HW1

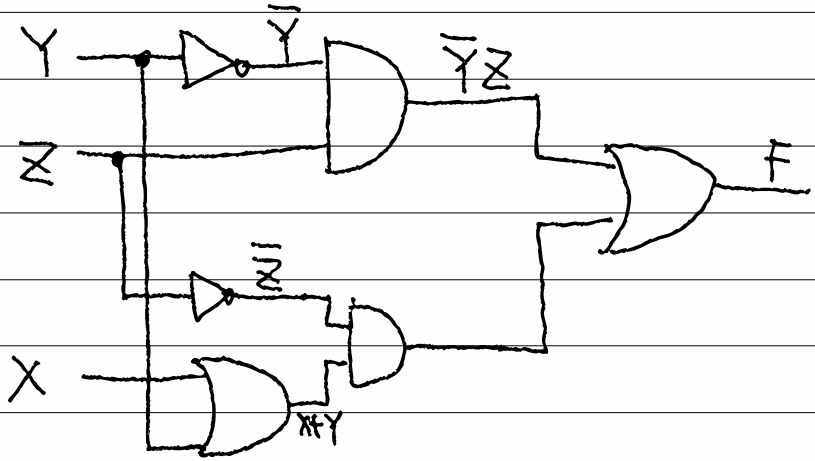
P1. Output1 = $\bar{A}\bar{B}C + A\bar{B}\bar{C} + AB\bar{C}$

Output 2 = $\bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + ABC$

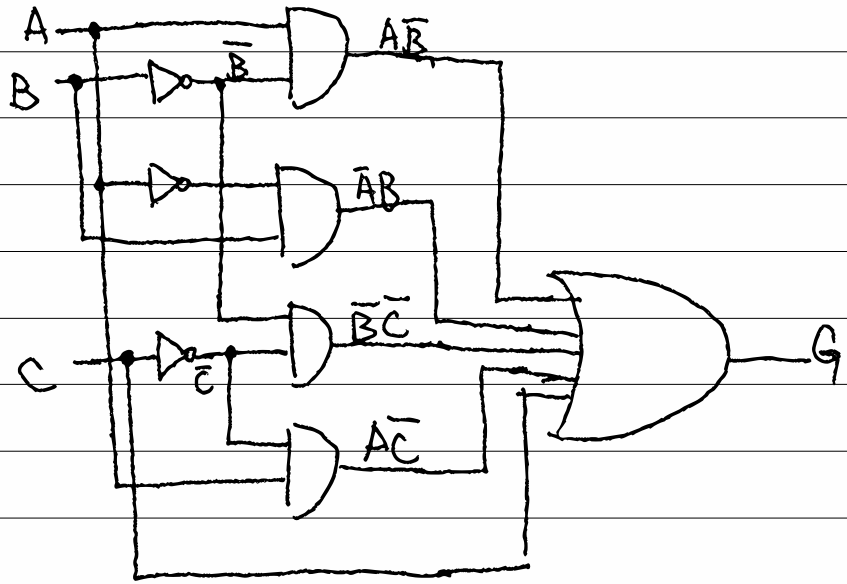
Output 3 = $\bar{A}\bar{B} + \bar{A}B + AB$

P2.

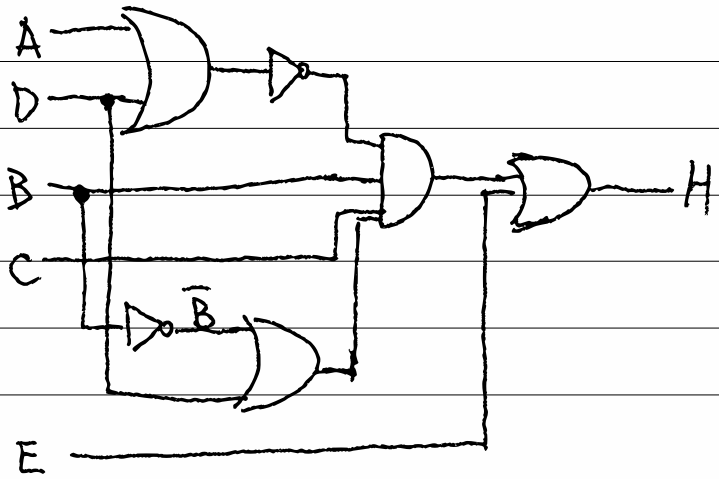
(1) $F = \bar{Y} * Z + \overline{\bar{Z} * (X + Y)}$



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



(3) $H = BC(\overline{A+D})C\bar{B}+D) + E$



P3. (1) $F = \bar{Y} * Z + \bar{Z} * \overline{(X+Y)}$

unclear which equations to be simplied.

$\bar{F} = \overline{\bar{Y} * Z + \bar{Z} * \overline{(X+Y)}}$

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

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

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

$= YZ + XY + \underset{Y}{Y\cancel{Y}} + \underset{0}{\cancel{Z\bar{Z}}} + X\bar{Z} + Y\bar{Z}$

$= YZ + Y\underbrace{(X+1)}_{1} + \bar{Z}(X+Y)$

$= Y(Z+1) + X\bar{Z} + Y\bar{Z}$

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

$= Y + XZ$

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

(2) $G = A\bar{B} + \bar{A} * B * \bar{C} + \bar{B} * \bar{C} + A\bar{C} + C$

$\overline{G} = A\bar{B} + \bar{A}B\bar{C} + \bar{B}\bar{C} + A\bar{C} + C$

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

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

$= (\bar{A}+B) * (A+\bar{B}+C) * (B+C) * (\underbrace{\bar{A}+C}_{\bar{C}\bar{A}}) * \bar{C}$

$= (\bar{A}+B) * [(A+\bar{B})(B+C) + \underbrace{C(B+C)}_{C}] * \bar{C}\bar{A}$

$= (\bar{A}+B) * [A(B+C) + \underbrace{\bar{B}(B+C)}_{\bar{B}C + C = C.} + C] * \bar{C}\bar{A}$

$= (\bar{A}+B) * [AB + \underbrace{CA+C}_{C.}] * \bar{C}\bar{A}$

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

$= (\bar{A}+B)\,AB \cdot \bar{C}\bar{A} + (\bar{A}+B)\,C \cdot \bar{C}\bar{A}$ $\quad A\bar{A}=0,\ C\bar{C}=0$

$= 0$

$G = \overline{\overline{G}} = \overline{0} = 1$

$$BD + \bar{B}$$

$$D + B\bar{D}$$

(3) $H = \overline{BC\overline{(A+D)}(\bar{B}+D)} + E$

$\bar{H} = BC\overline{(A+D)}(\bar{B}+D) + E$

$= [\overline{(\bar{B}+C)} + (A+D) + B\bar{D}] * \bar{E}$

$B+\bar{B}=1$

$X(X+Y)=X$

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

$= [A + \bar{B}\bar{C} + D + D\bar{B}] * \bar{E}$

$= [A + \bar{B} + \bar{C} + B + D] * \bar{E}$

$= [A + 1 + \bar{C} + D] * \bar{E}$

$= \bar{E}$

$B(\bar{B}+D) = BD$

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

$\bar{A}BCD\bar{D} = 0$

$H = E$

$\bar{H} = \bar{E}$

Or,

$\bar{H} = \overline{BC(\bar{B}+D)}\overline{(A+D)} + E$

$= \overline{CBD(A+D)} * \bar{E}$

$= [\bar{C} + \bar{B} + \bar{D} + A\bar{D}] * \bar{E}$

$= [A + \bar{B} + \bar{C} + 1] * \bar{E}$

$= \bar{E}$

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

$X(X+Y) = X$

P4.

(1) $F = AC + \bar{A}\bar{B}C + BC + \bar{C}$

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

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

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

$= CA + C\bar{B} + \bar{C} + B$

$= CA + \bar{C} + B + \bar{B}C$

$= \bar{C} + A + B + C$

$= A + B + C + \bar{C}$

$= 1$

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

$= (\bar{Y}+\bar{Z})(\cancel{X\bar{X}}^{0} + \bar{X}Y) + XY + Y\bar{Z}$

$= \cancel{\bar{X}\bar{Y}Y} + \bar{X}Y\bar{Z} + XY + Y\bar{Z}$

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

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

(3) $H = \bar{Y}Z + \bar{X}YZ + \bar{X}Y + XY\bar{Z} + XZ\bar{Y} + Z\bar{Y}$

$= \bar{Y}Z + \bar{X}Y(1+Z) + XY\bar{Z} + XZ\bar{Y}$

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

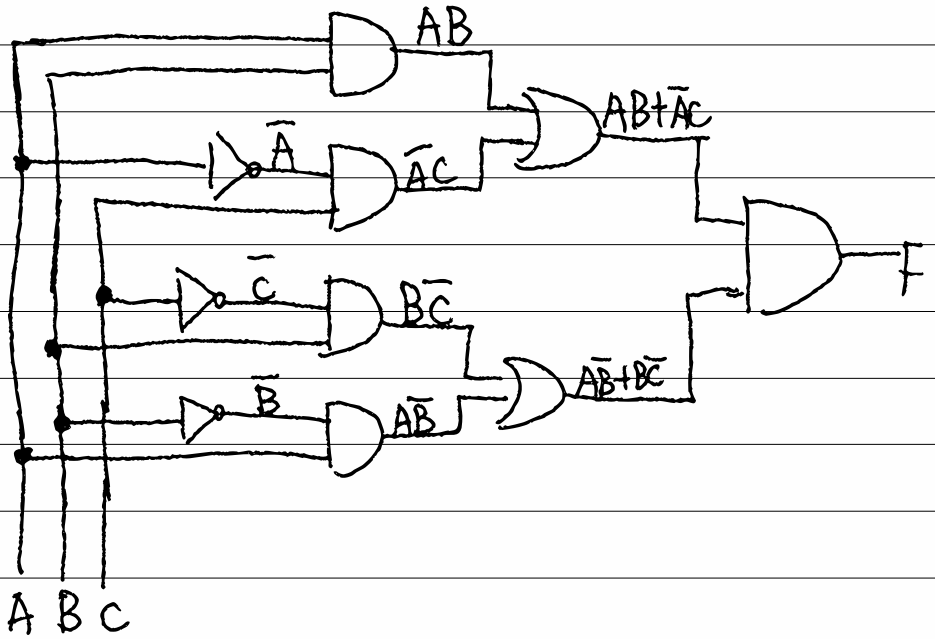
$= Y\bar{Z} + XY + XZ\bar{Y} + Z\bar{Y}$

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

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

$= Y + Z + X$

P5.



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

$= AA\bar{B}\bar{B} + AB\bar{B}\bar{C} + A\bar{A}\bar{B}C + \bar{A}B\bar{C}\bar{C}$

$= AB\bar{C}$