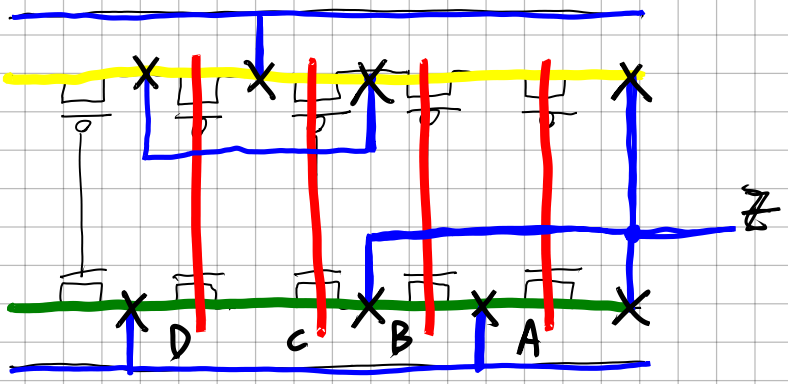
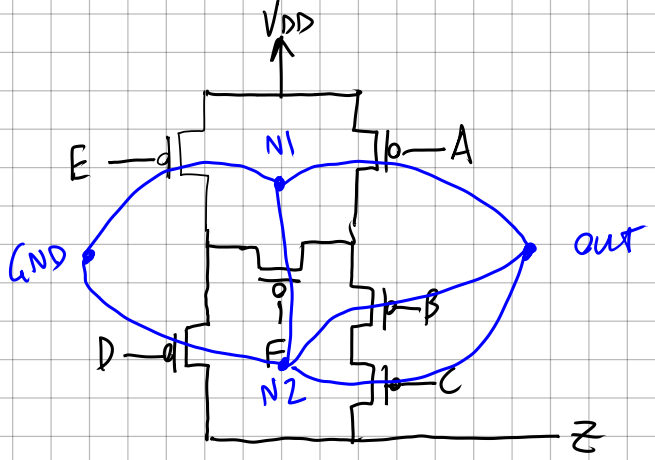
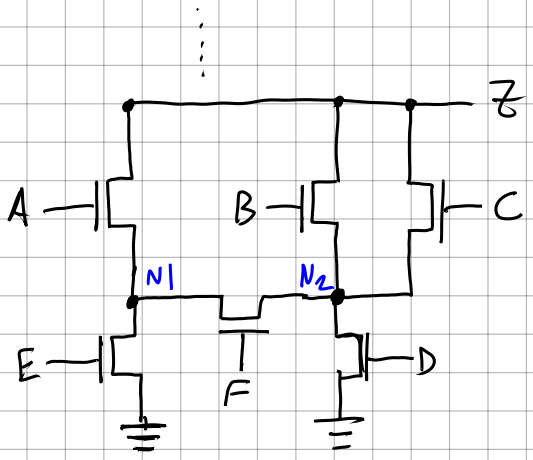
①







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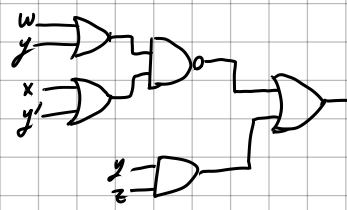
②

$f(w,x,y,z) = (yz)' \cdot ((w+y)' + (x+y')')$

$f = yz + ((w+y)(x+y'))' = yz + (wx + xy)'$

$= yz + (x(w+y))'$



$f = yz + x' + (w+y)'$

$= yz + \bar{x} + \bar{w}\bar{y}$

$(w+y)x + (w+y)y'$

$wx + xy + w$

$w(x+1) + xy$

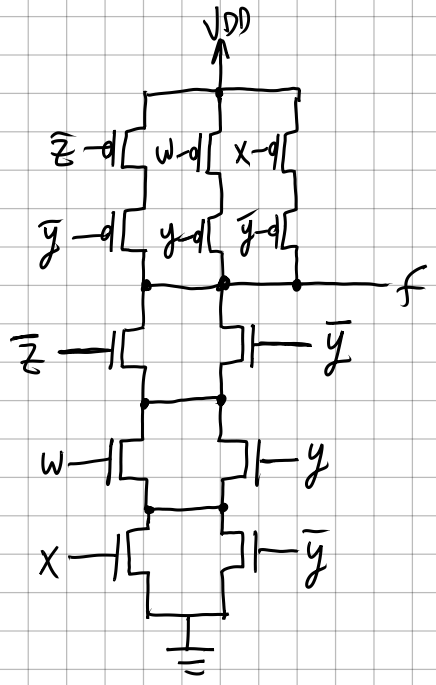
$f_n = (zy)' \cdot ((w+y)' + (x+\bar{y})')'$

$= (zy)' \cdot (\bar{w}\bar{y} + \bar{x}y)'$

$= (zy)' \cdot (\bar{w}\bar{y})' \cdot (\bar{x}y)'$

$= (\bar{z} + \bar{y}) \cdot (w+y) \cdot (x+\bar{y})$

$f_p = z\bar{y} + wy + x\bar{y}$



③

A	B	X	Y
0	0	0	1
1	0	1	0
0	1	1	0
1	1	0	1

$X = A \oplus B$

$Y = \overline{A \oplus B}$

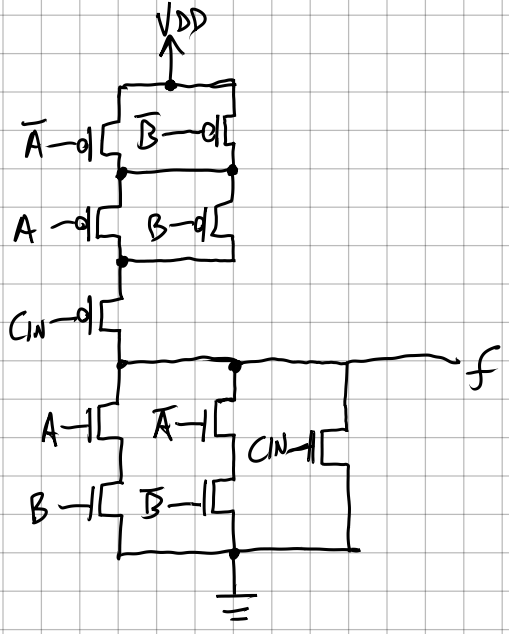
④

$$f(A, B, C_{IN}) = \overline{(A \oplus B)} \cdot C_{IN} = (AB + \bar{A} \cdot \bar{B}) C_{IN}$$
$$= (AB + (A+B)') C_{IN}$$

$$f_n = \overline{(A \oplus B) \cdot C_{IN}} = A \oplus B + \overline{C_{IN}}$$

$$f_n = AB + \bar{A}\bar{B} + C_{IN}$$

$$f_p = (A+B)(\bar{A}+\bar{B})(C_{IN})$$



⑤

1) $ab + bdc + ca'$

no further simplification

2) $(x+y)(x+z)$

$(x+y)x + (x+y)z$

$y + xz + yz$

$y(1+z) + xz$

$yz + xz$

$z(y+x)$

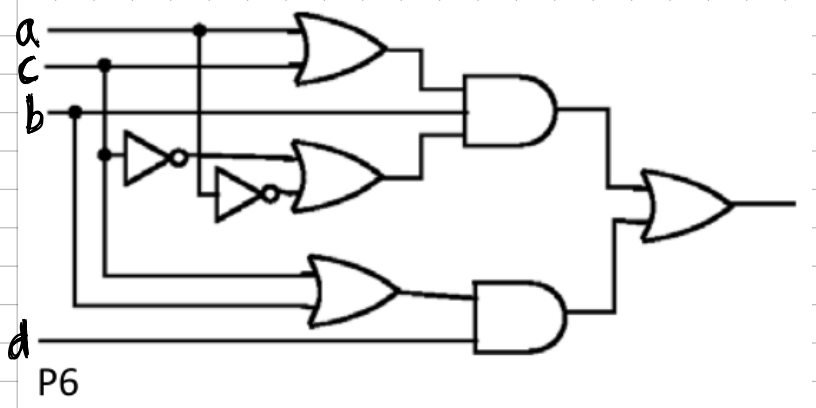
3) $a(b+c+d) + b(c+d+a) + c(d+a+b) + d(a+b+c)$

~~$ab + ac + ad + bc + bd + ba + cd + ca + cb + da + db + dc$~~

$ab + ac + ad + bc + bd + cd$

$a(b+c+d) + b(c+d) + cd$

⑥



P6

$$((w+x)\cdot y\cdot(w'+x'))+(z(x+y))$$

$$((wy+xy)\cdot(w'+x'))+(zx+yz)$$

$$(w'(wy+xy)+x'(wy+xy))+xz+yz$$

$$w'xy+x'wy+xz+yz$$

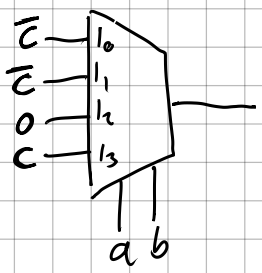
$$y(w'x+x'w)+xz+yz$$

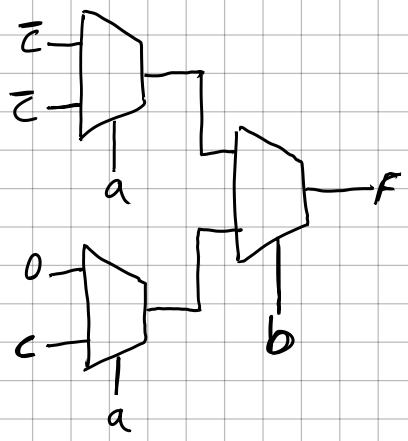
$$db+db'c+abc'+a'bc$$

$$db'c+db+b(ac'+a'c)$$

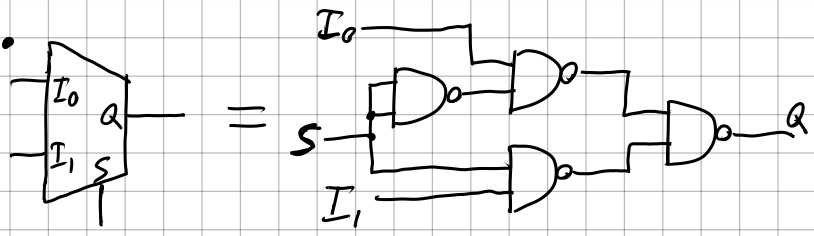
(7)

a	b	c	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1





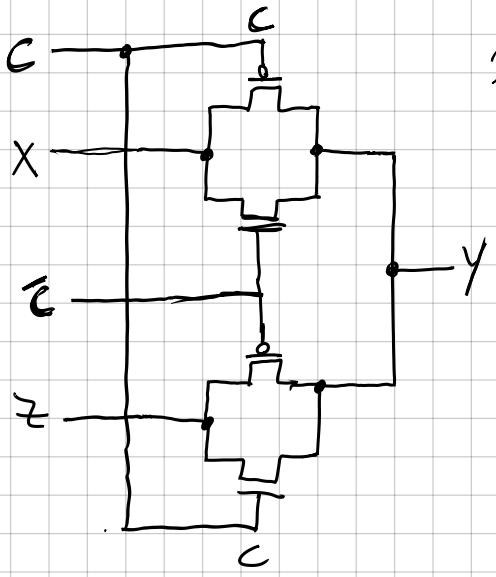
1.



2. 16 transistors per 2-to-1 mux.
   48 transistors total.

3. 4 per mux
   16 transistors total.

⑧



2-to-1 mux