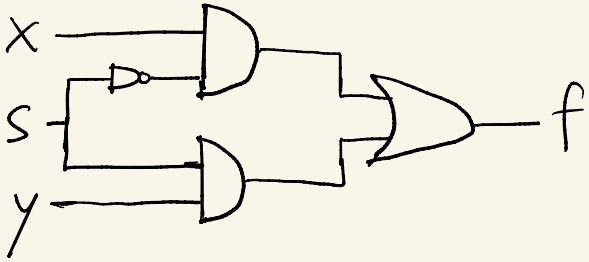
Part I:

Sept 21, 2021

2-to-1 Multiplexer: $f = x\bar{s} + ys$

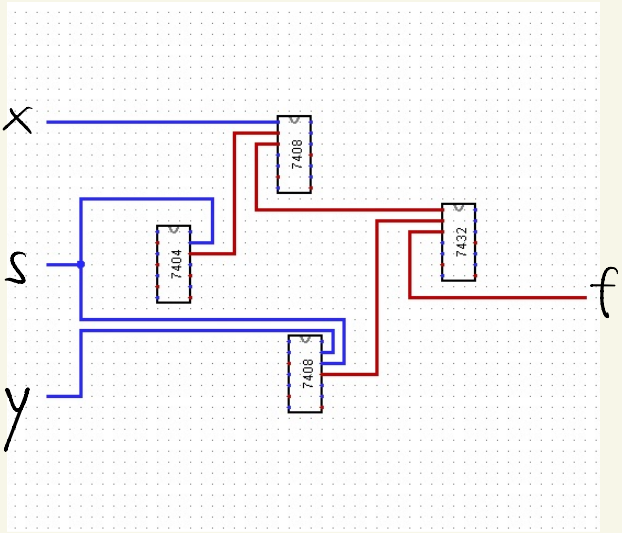
1)



2)

x	y	s	f
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

3)



4) Use a NAND gate (7400) instead of a NOT and AND or use one AND gate instead of 2.

Part II:

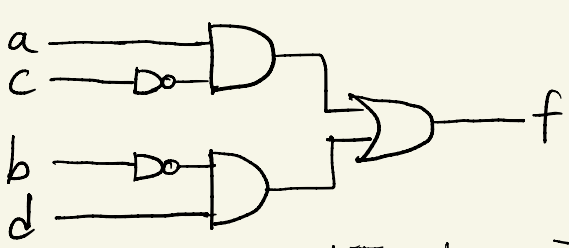
$$f = \bar{b}(a\bar{c} + \bar{a}d) + a(b\bar{c} + \bar{b}d)$$

$$= a\bar{b}\bar{c} + \bar{a}\bar{b}d + ab\bar{c} + a\bar{b}d \quad \text{※Distributive}$$

$$= a\bar{c}(\bar{b} + b) + \bar{b}d(\bar{a} + a) \quad \text{※Distributive}$$

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

1)



2)

a	b	c	d	$a\bar{c}$	$\bar{b}d$	$a\bar{c} + \bar{b}d$
0	0	0	0	0	0	0
0	0	0	1	0	1	1
0	0	1	0	0	0	0
0	0	1	1	0	1	1
0	1	0	0	0	0	0
0	1	0	1	0	0	0
0	1	1	0	0	0	0
0	1	1	1	0	0	0
1	0	0	0	1	0	1
1	0	0	1	1	1	1
1	0	1	0	0	0	0

1	0	1	1	0	1	1
1	1	0	0	1	0	1
1	1	0	1	1	0	1
1	1	1	0	0	0	0
1	1	1	1	0	0	0

3)