State Machines

Exercise 1: If we used 8-bits of state information, how many states could be represented? What if we used 8 bits of state but used a "one-hot" encoding?

00000000
00000001
⋮
11111110
11111111

$2^8 = 256$ possible states.

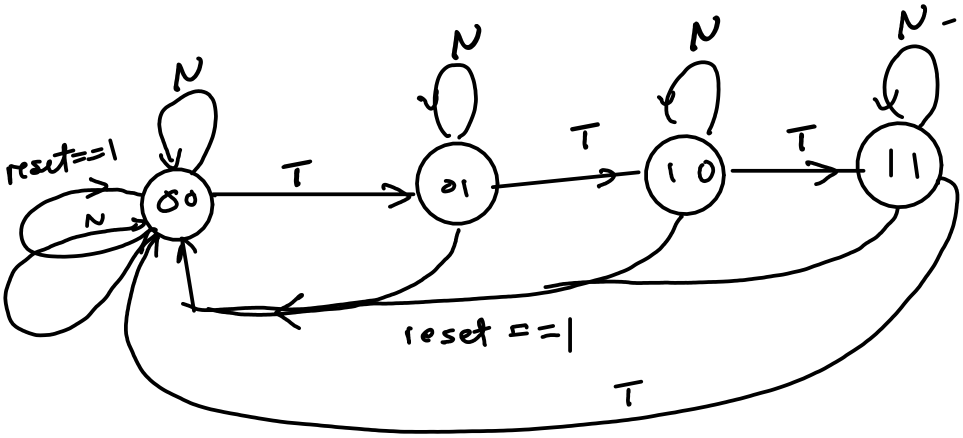
0000 0001
0000 0010
⋮
1000 0000

8 possible states.

Exercise 2: What happens if both reset and enable are asserted?

reset because it is tested first

Exercise 3: Draw the state transition diagram.



T : reset==0 && enable==1
N : reset==0 && enable==0

Exercise 4: Write the state transition table for each state machine.

state	count	next state
x	≠ 0	x
rg	0	ry
ry	0	gr
gr	0	yr
yr	0	rg

count	state	next count
0	rg, gr	4
0	yr, ry	29
≠0	X	count − 1

Exercise 5: What is the size of the expression `sqrt*sqrt`? Of `{8'b0,sqrt}*sqrt`?

from Table 11-21,

$$\max(L(sqrt), L(sqrt)) = \max(8, 8) = 8$$

$$\max(L(\{8'b0, sqrt\}), L(sqrt)) = \max(8+8, 8) = 16.$$

Exercise 6: Draw the state transition diagram (use $\Delta = 0$ and $\Delta \neq 0$ as the states).