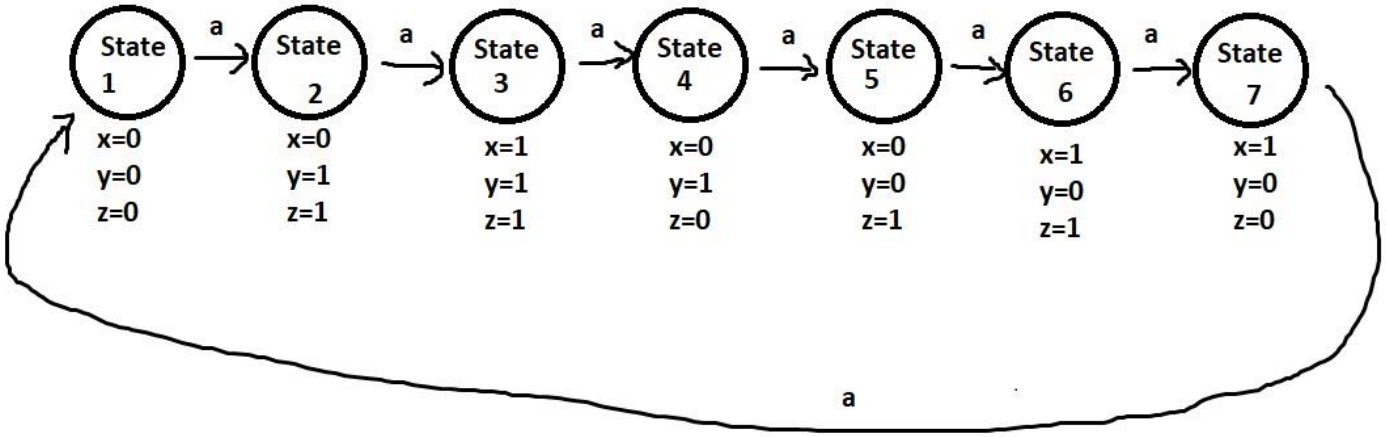
Hasan Mutlu – 1801042673 – CSE 232 Homework 3

Step 1: Create FSM



Step 2: Obtain architecture:

- ➔ **7 States (3 bits register)**
- ➔ **3 bits for coming states**
- ➔ **xyz is output**
- ➔ **a is input**

Step 3: Encode states

	R2	R1	R0
State 1	0	0	0
State 2	0	1	1
State 3	1	1	1
State 4	0	1	0
State 5	0	0	1
State 6	1	0	1
State 7	1	0	0

Step 4: Generate state table:

- ➔ Inputs: R2, R1, R0, a
- ➔ Outputs: N2, N1, N0
- ➔ **The output xyz will be equal to R2,R1,R0 so they will not be on the truth table.**
- ➔ **R2 = x**
- ➔ **R1 = y**
- ➔ **R0 = z**

	R2	R1	R0	a		N2	N1	N0
State 1	0	0	0	0		0	0	0
	0	0	0	1		0	1	1
State 5	0	0	1	0		0	0	1
	0	0	1	1		1	0	1
State 4	0	1	0	0		0	1	0
	0	1	0	1		0	0	1
State 2	0	1	1	0		0	1	1
	0	1	1	1		1	1	1
State 7	1	0	0	0		1	0	0
	1	0	0	1		0	0	0
State 6	1	0	1	0		1	0	1
	1	0	1	1		1	0	0
Will not happen	1	1	0	0		x	x	X
	1	1	0	1		x	x	X
State 3	1	1	1	0		1	1	1
	1	1	1	1		0	1	0

Step 5: Obtain Boolean expressions and draw controller

Karnaugh Map for N2:

R2.R1 \ R0.a	00	01	11	10
00	0	0	1	0
01	0	0	1	0
11	x	x	0	1
10	1	0	1	1

N2 = R2.a' + R2'.R0.a + R2.R1'.R0

Karnaugh Map for N1:

R2.R1 \ R0.a	00	01	11	10
00	0	1	0	0
01	1	0	1	1
11	x	x	1	1
10	0	0	0	0

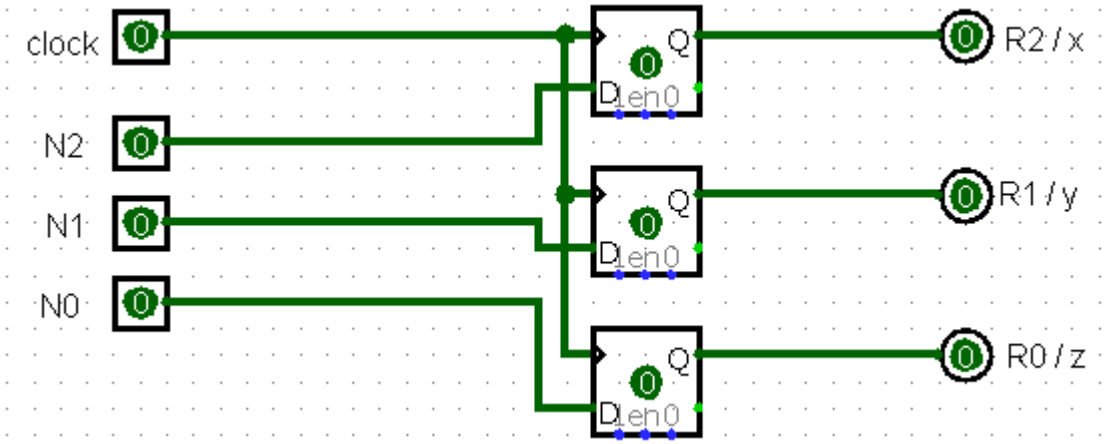
N1 = R1.R0 + R1.a' + R2'.R1'.R0'.a

Karnaugh Map for N0:

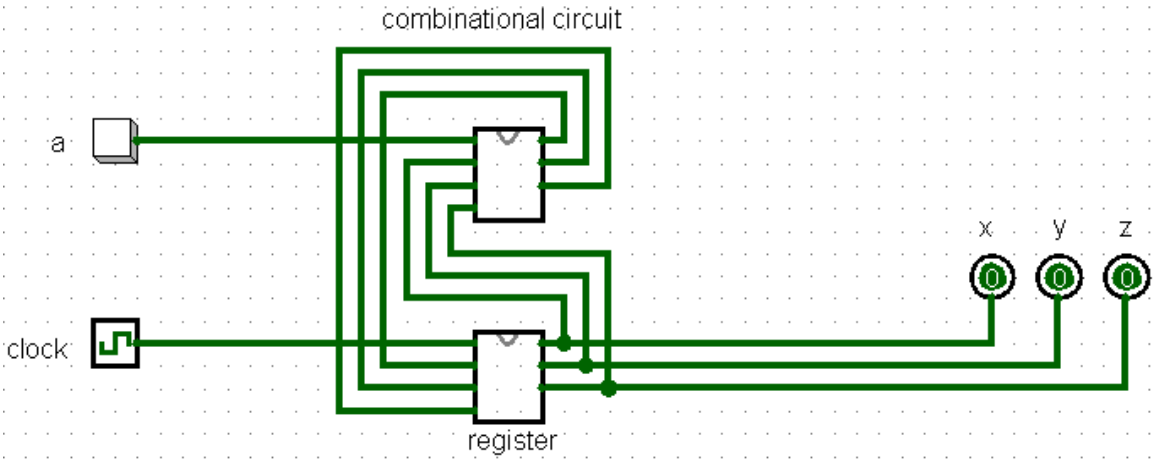
R0.a / R2.R1	00	01	11	10
00	0	1	1	1
01	0	1	1	1
11	x	x	0	1
10	0	0	0	1

N0 = R2'.a + R2'.R0 + R0.a'

Register Part:



Entire circuit:



Combinational part: