

LSC 258 Lab 6

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Part I 1. the Reset signal is asynchronous

It is active high

The output after Reset should be our first state,

and after Reset, z should be 1 as we put

1111 or 1101 into the circuit.

2. current state Next state

	F_1	F_0	z	w	F_2	F_1	F_0	
A	0	0	0	0	0	0	0	A
	0	0	0	1	0	0	1	B
B	0	0	1	0	0	0	0	A
	0	0	1	0	1	0	1	C
C	0	1	1	0	0	1	0	E
	0	1	1	0	1	0	1	D
D	0	1	0	0	1	0	0	E
	0	1	0	0	1	1	0	F
E	1	0	0	0	0	0	0	A
	1	0	0	0	1	0	1	G
F	1	1	0	1	0	1	0	E
	1	1	0	1	1	1	0	F
G	1	0	1	1	0	0	0	A
	1	0	1	1	0	1	1	C

F_2 :

	$\bar{F}_0 \cdot \bar{w}$	$\bar{F}_0 \cdot w$	$F_0 \cdot w$	$F_0 \cdot \bar{w}$
$\bar{F}_2 \cdot \bar{F}_1$	0	0	0	0
$\bar{F}_2 \cdot F_1$	1	1	0	1
$F_2 \cdot \bar{F}_1$	1	1	X	X
$F_2 \cdot F_1$	0	1	0	0

$$\bar{F}_2 = F_1 + \bar{F}_0 + F_2 \cdot \bar{F}_0 \cdot w$$

$$+ F_1 \cdot F_0 \cdot \bar{w}$$

F_1 :

	$\bar{F}_0 \cdot \bar{W}$	$\bar{F}_0 \cdot W$	$F_0 \cdot w$	$F_0 \cdot \bar{W}$
$\bar{F}_2 \cdot \bar{F}_1$	0	0	1	0
$\bar{F}_2 \cdot F_1$	0	1	1	0
$F_2 \cdot \bar{F}_1$	0	1	X	X
$F_2 \cdot F_1$	0	0	1	0

$$F_1 = F_1 \cdot W + F_0 \cdot \bar{W}$$

F_0 :

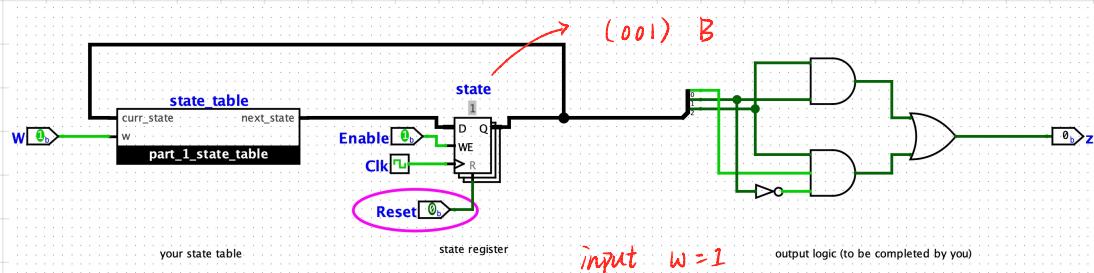
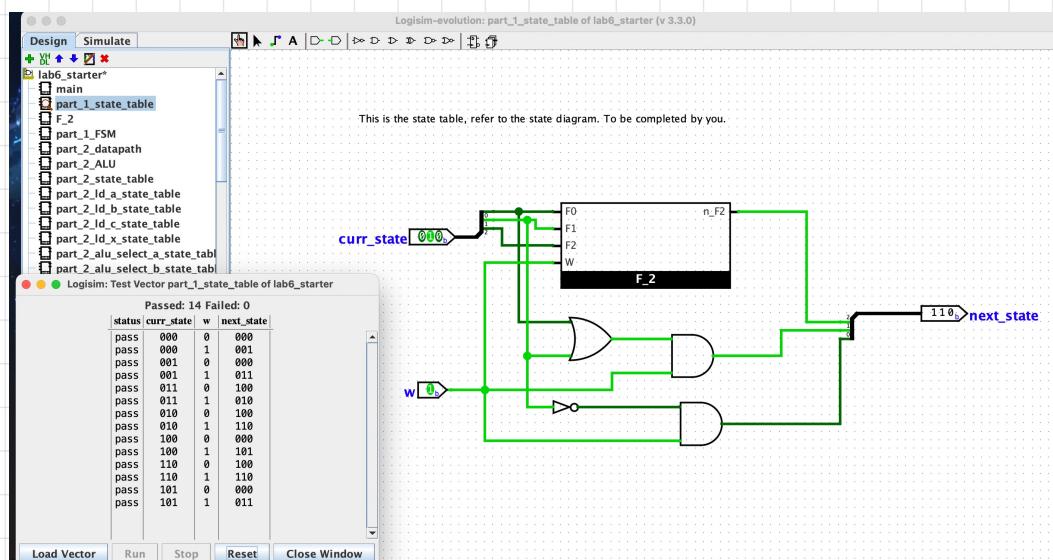
	$\bar{F}_0 \cdot \bar{W}$	$\bar{F}_0 \cdot W$	$F_0 \cdot w$	$F_0 \cdot \bar{W}$
$\bar{F}_2 \cdot \bar{F}_1$	0	1	1	0
$\bar{F}_2 \cdot F_1$	0	0	0	0
$F_2 \cdot \bar{F}_1$	0	0	X	X
$F_2 \cdot F_1$	0	1	1	0

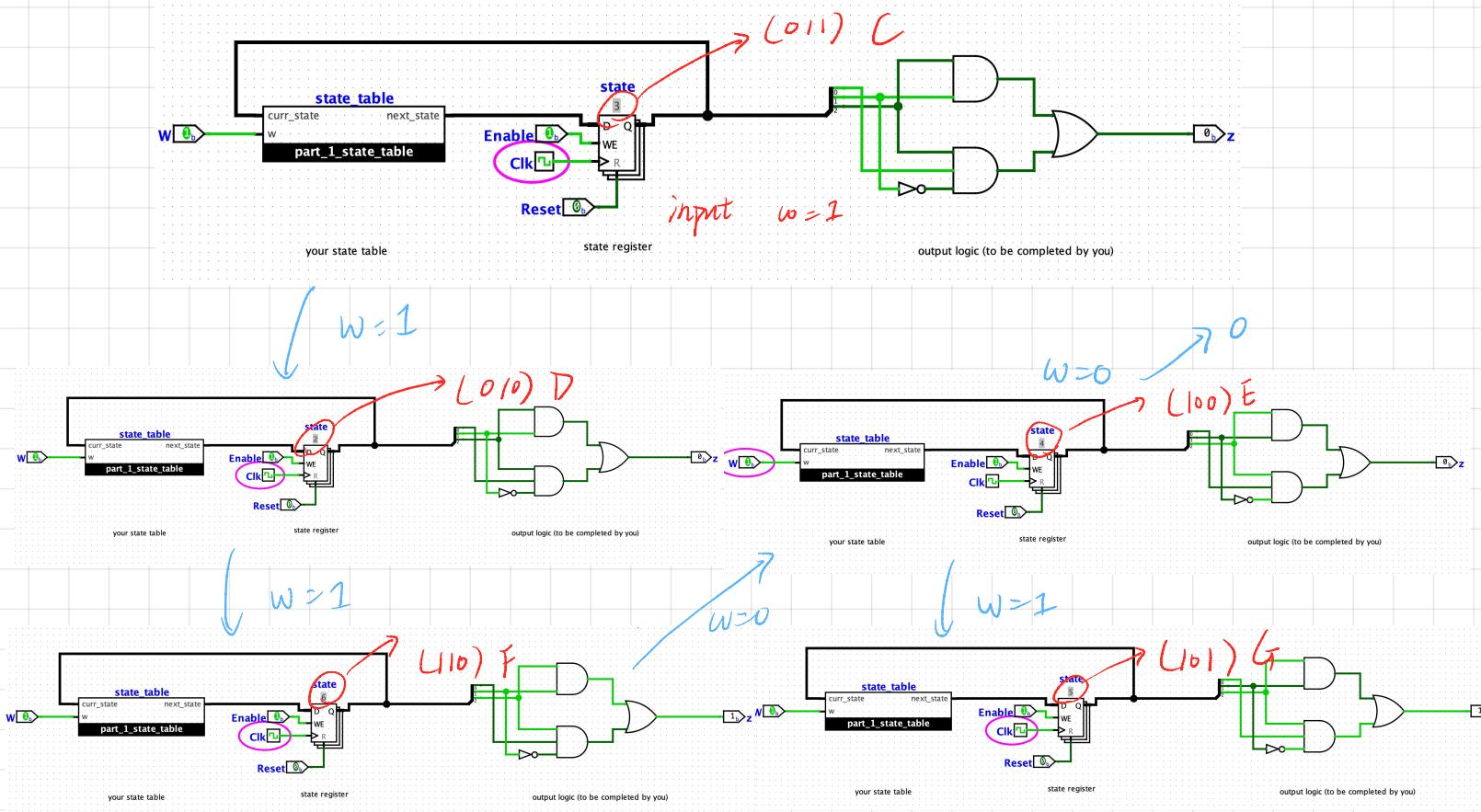
$$\bar{F}_0 = \bar{F}_1 \cdot W$$

5.

We need to test 2 route that makes $z = 1$ (1101 and 1111)

Then for each state, test the next state with $w=0$ and $w=1$





Part II

2.

Load RA

$1d - a = 1$, others are 0

load R_B

$|d - b| = 1$, others are 0

load R_c

$|d - c| = 1$, others are 0

load Rx

$$1d - x = 1 \quad , \text{ others are } 0$$

$$Cx^2 + Bx + A$$

multiply R_B and R_X
and store in $R_B(B_X)$

$$\text{alt_op} = 1 \quad , \quad \text{alt_select_a} = 11$$

$$\text{adj-select_b} = 0.1 \quad \text{adj_out} = 1$$

$$1d - b = 1$$

add RA to R₃
and store in RA ($B_x + A$)

$$adu - op = 0 \quad , \quad adu - select_a = 0$$

$$a_{lu} - \text{select} - b = 0 \quad , \quad 1d - a_{lu} - \text{out} = 1$$

$$1d - a = 1$$

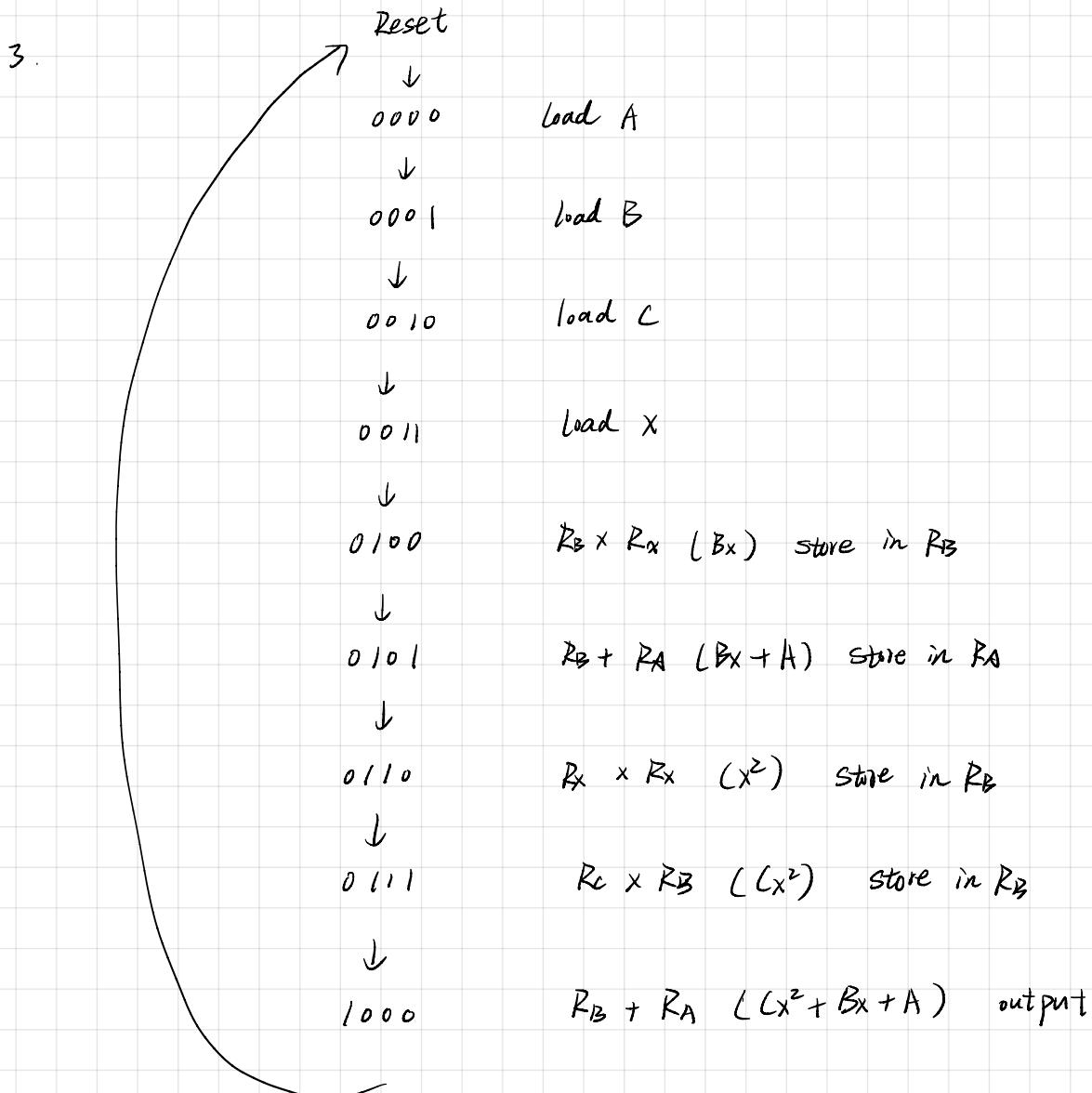
multiply R_x and R_x
and store in R_B (x^2)

$$\text{alu_op} = 1 \quad , \quad \text{alu_select_a} = 11$$

$$\text{alu_select_b} = 11 \quad , \quad \text{id_alu_out} = 1$$

multiply R_C and R_B
 and store in R_B (Cx^2) $alu_op = 1$, $alu_select_a = 10$
 $alu_select_b = 01$, $ld_alu_out = 1$
 $ld_b = 1$

add R_B to R_A
 and output the result $alu_op = 0$, $alu_select_a = 00$
 $alu_select_b = 01$, $ld_r = 1$
 $(Cx^2 + Bx + A)$



ld_b

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_2 \cdot \bar{F}_2$	0	1	0	0
$\bar{F}_3 \cdot \bar{F}_2$	1	0	1	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

$$\bar{F}_2 \cdot \bar{F}_1 \cdot F_0 + F_2 \cdot \bar{F}_0 + F_2 \cdot F_1$$

ld-alu_out

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_2 \cdot \bar{F}_2$	0	0	0	0
$\bar{F}_3 \cdot \bar{F}_2$	1	1	1	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

 F_2

alu_op

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_2 \cdot \bar{F}_2$	0	0	0	0
$\bar{F}_3 \cdot \bar{F}_2$	1	0	1	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

$$- F_2 \cdot F_0 + F_2 \cdot F_1$$

alu-select_a[0]

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_2 \cdot \bar{F}_2$	0	0	0	0
$\bar{F}_3 \cdot \bar{F}_2$	1	0	0	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

 $\bar{F}_2 \cdot \bar{F}_0$

alu-select_a[1]

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_2 \cdot \bar{F}_2$	0	0	0	0
$\bar{F}_3 \cdot \bar{F}_2$	1	0	1	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

$$- F_2 \cdot F_0 + F_2 \cdot F_1$$

alu-select_b[0]

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_2 \cdot \bar{F}_2$	0	0	0	0
$\bar{F}_3 \cdot \bar{F}_2$	1	1	1	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	1	X	X	X

 $F_2 + F_3$

also - select - b []

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_3 \cdot \bar{F}_2$	0	0	0	0
$\bar{F}_3 \cdot F_2$	0	0	0	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

$$F_2, F_1, \bar{F}_0$$

F_3

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_3 \cdot \bar{F}_2$	0	0	0	0
$\bar{F}_3 \cdot F_2$	0	0	1	0
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

$$F_2, F_1, F_0$$

F_2

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_3 \cdot \bar{F}_2$	0	0	1	0
$\bar{F}_3 \cdot F_2$	1	1	0	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

$$F_2 \cdot \bar{F}_1 + \bar{F}_2 \cdot F_1 \cdot F_0 + F_2 \cdot \bar{F}_0$$

F_1

	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_3 \cdot \bar{F}_2$	0	1	0	1
$\bar{F}_3 \cdot F_2$	0	1	0	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

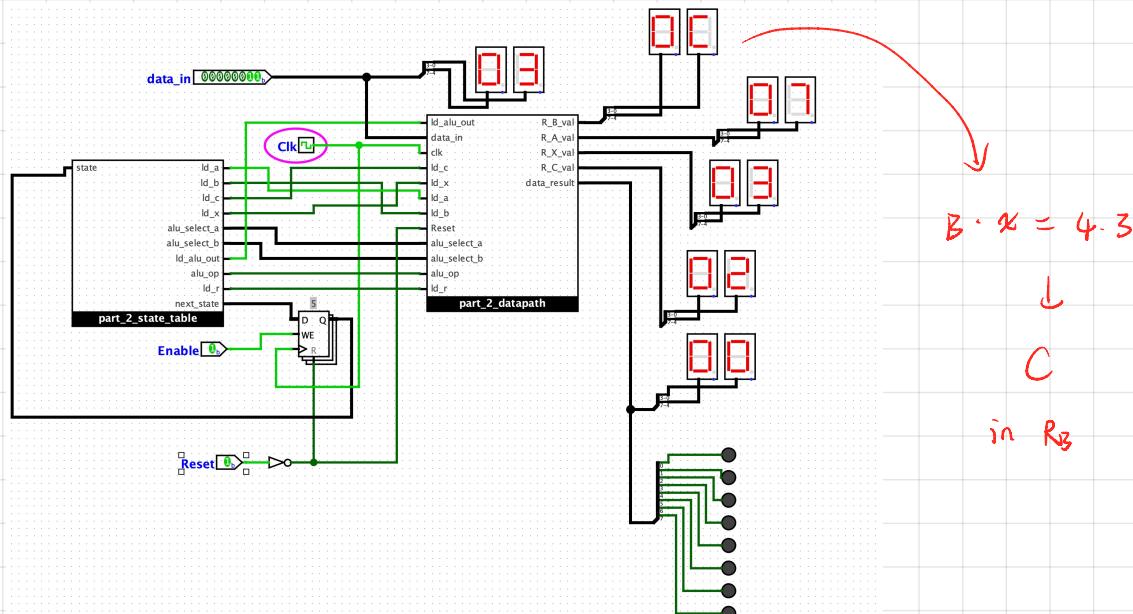
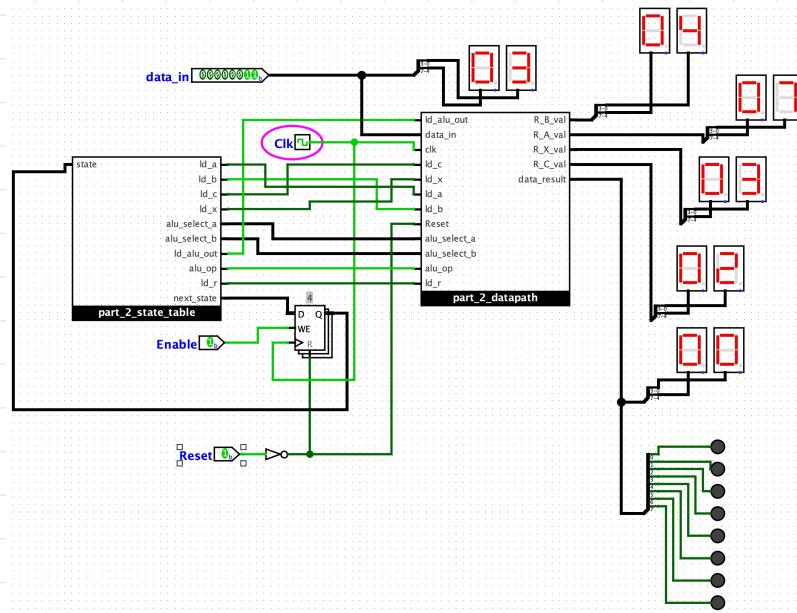
$$\bar{F}_1 \cdot F_0 + F_1 \cdot \bar{F}_0$$

F_0

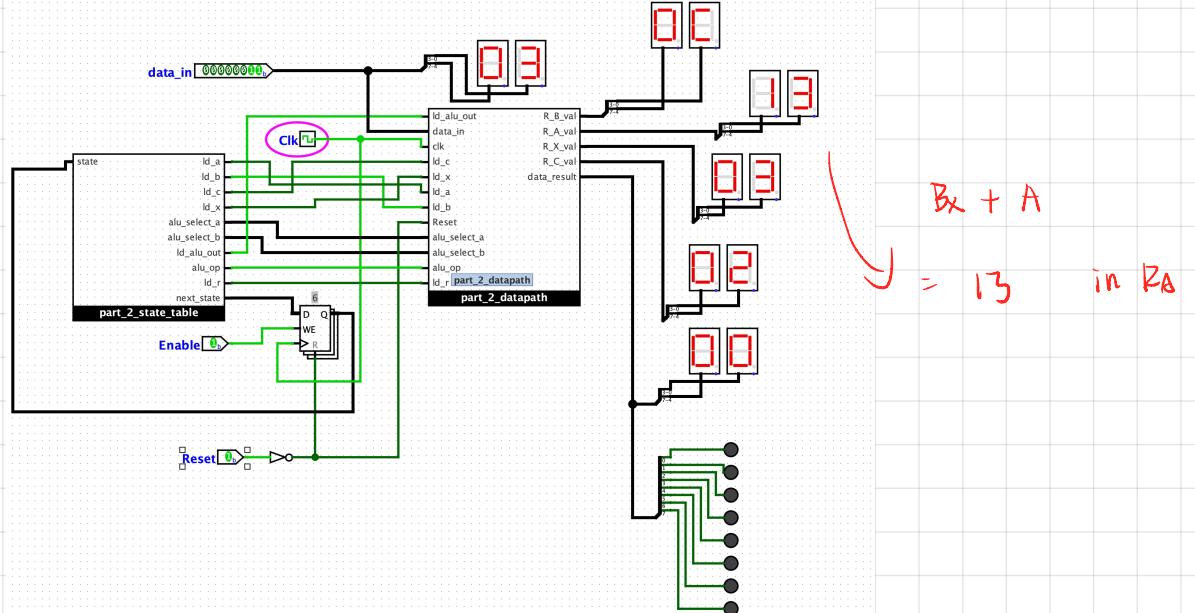
	$\bar{F}_1 \cdot \bar{F}_0$	$\bar{F}_1 \cdot F_0$	$F_1 \cdot F_0$	$F_1 \cdot \bar{F}_0$
$\bar{F}_3 \cdot \bar{F}_2$	1	0	0	1
$\bar{F}_3 \cdot F_2$	1	0	0	1
$F_3 \cdot F_2$	X	X	X	X
$F_3 \cdot \bar{F}_2$	0	X	X	X

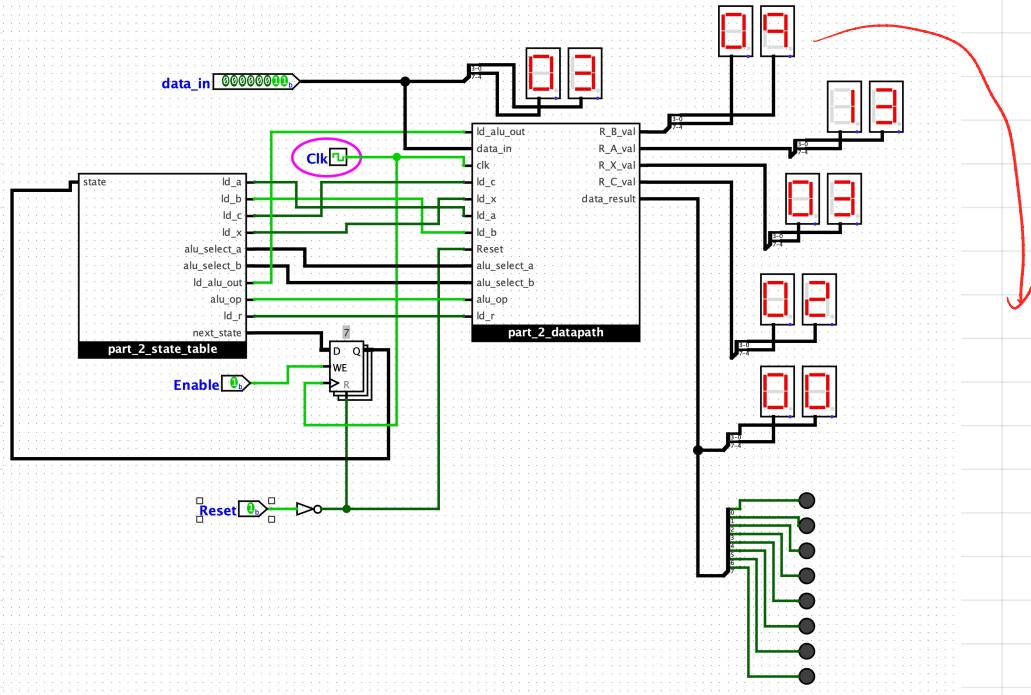
$$\bar{F}_3 \cdot \bar{F}_0$$

5.

 $A = 7$ $B = 4$ $C = 2$ $x = 3$ 

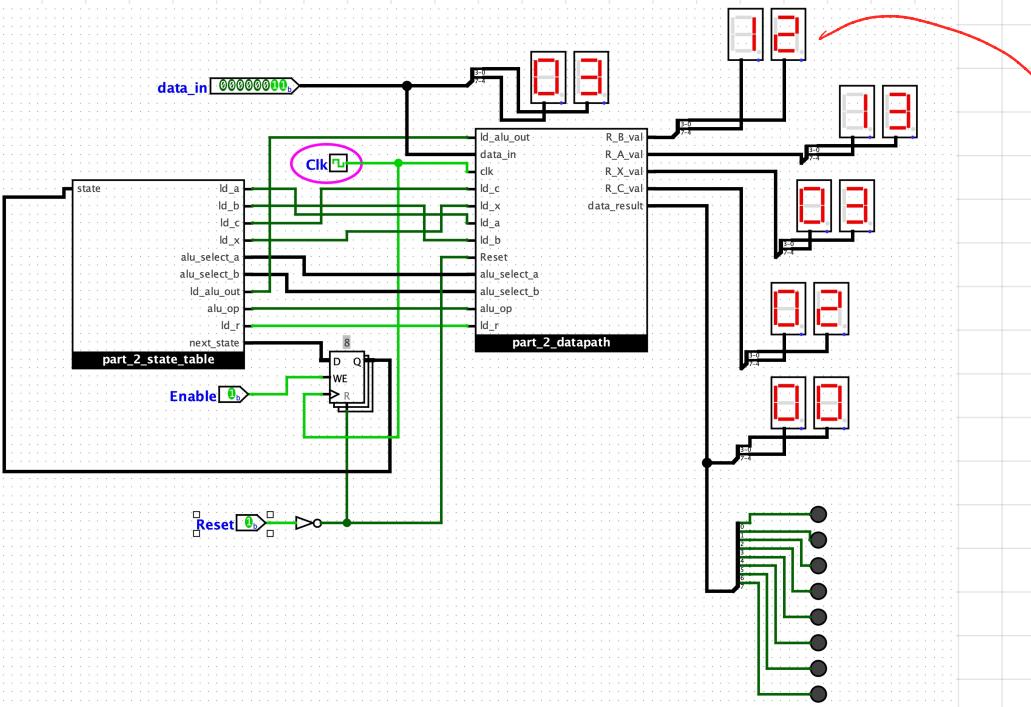
C
in R_B





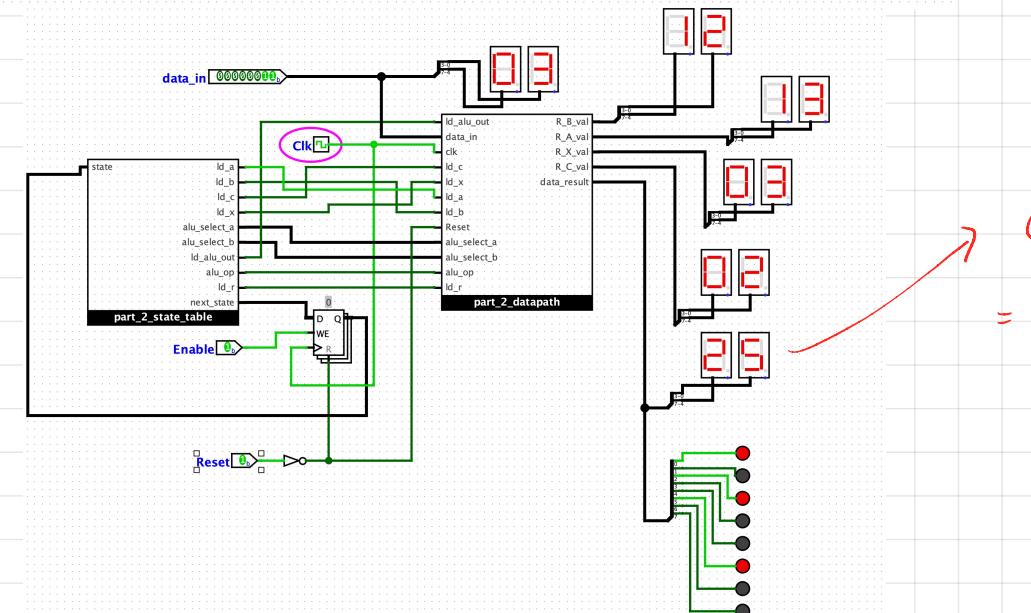
$$x^2 = 3^2 = 9$$

in R_B



$$Cx^2 = 2 \times 9 = 12$$

in R_B



$$Cx^2 + (Bx + A) = 12 + 13$$

= 25