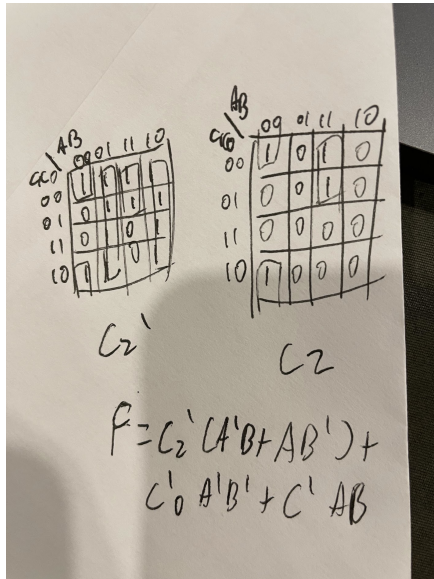


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Lab 9

## Deliverables



A	B	C	D	E	F	G	H	I	ERR
0	0	0	0	0	0	0	0	0	NONE
1	0	0	0	0	0	1	0	1	5
1	1	0	0	0	0	1	0	0	4
1	0	1	0	0	0	0	1	1	3
1	0	0	1	0	0	0	1	0	2
1	0	0	0	1	0	0	0	1	1
0	1	0	0	1	0	1	1	0	6
0	1	0	1	0	0	1	1	1	7
0	1	1	0	0	1	0	0	0	8
0	1	0	0	0	1	0	0	1	9
0	0	1	0	1	1	0	1	0	10

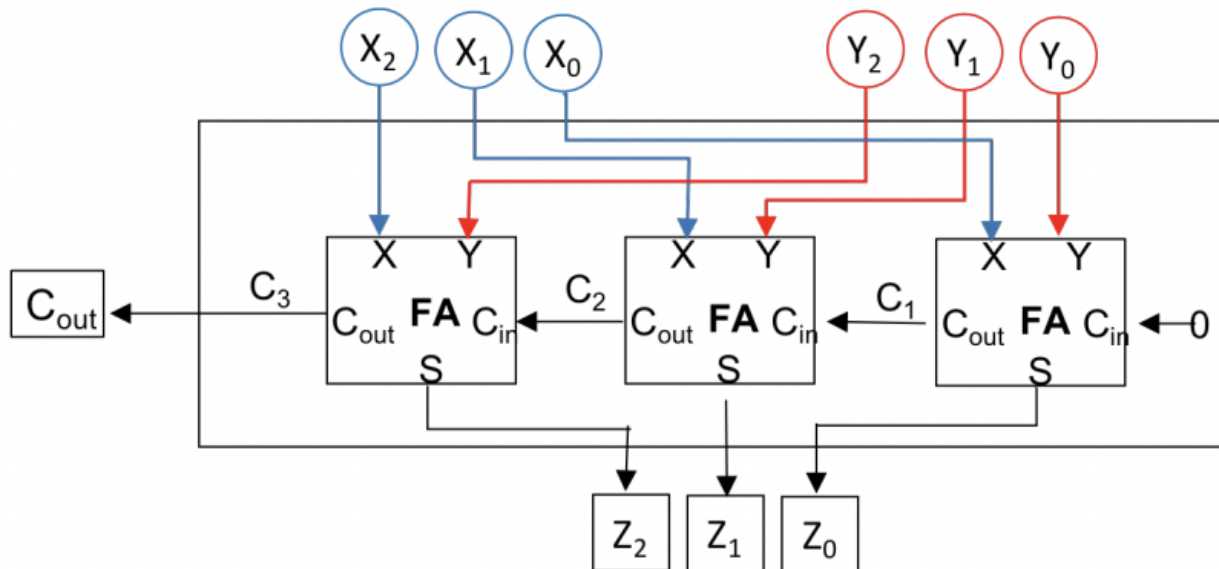
0	0	1	1	0	1	0	1	1	11
0	0	1	0	0	1	1	0	0	12
0	0	0	1	1	1	1	0	1	13
0	0	0	1	0	1	1	1	0	14
0	0	0	0	1	1	1	1	1	15

## Discussion

In this lab we created a circuit through a PLA and an error detector. I learned more about how both work and how to create a PLA through logicworks. I feel like this lab was pretty simple and straightforward.

## Questions

1. A circuit for adding two 3-bit 2's complement numbers ( $X_2X_1X_0$  and  $Y_2Y_1Y_0$ ) that uses Full Adder (FA) components is shown below. Write the full logic expression to detect overflow.



$((X_2 \text{ XNOR } Y_2) \text{ XOR } Z_2)$

2. Assume that the following are concurrent VHDL statements:  
 $L \leq P \text{ and } Q \text{ after } 10 \text{ ns};$   
 $M \leq L \text{ nor } N \text{ after } 5 \text{ ns};$   
 $R \leq \text{not } M;$

**At time  $t = 0$  ns,  $P = 0$ ,  $Q = 0$ , and  $N = 0$ .**

**If  $Q$  and  $P$  become 1 at time  $t = 5$  ns...**

- a) At what time will the first line execute?** 0ns when it begins
- b) At what time will  $L$  be updated?** 10ns
- c) At what time will the third line execute?** 0ns
- d) At what time will  $R$  be updated?** Right away as there is no delay

**3. Some questions from the final set of modules:**

**a) What is the Nyquist criterion?**

Nyquist criterion is the stability of a feedback system. Nyquist criterion is double the given sampling frequency to convert from analog to digital.

**b) What in an ADC? What meaning does “resolution” have in this context?**

ADC is analog to digital converter. The resolution is how many bits are received from the conversion as if there are more bits, the clearer it would be.

**c) Sort cache, magnetic disk, register, main memory, and optical disk from lowest to highest access time.**

Register -> Sort Cache -> Main Memory -> Magnetic Disk -> Optical Disk

**d) Define non-volatile memory.**

Non volatile memory is memory that is kept when the device is powered off or shutdown.