

# **UNIVERSIDADE FEDERAL DE OURO PRETO**

## **CIÊNCIA DA COMPUTAÇÃO**

JULIANA APARECIDA BORGES  
MARIA CLARA MIRANDA DE SÁ

### **RELATÓRIO 09**

Circuitos Combinacionais e Portas Lógicas Universais

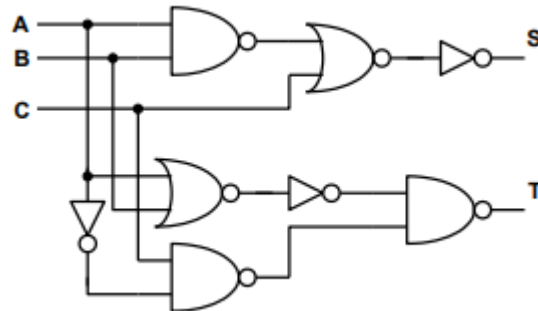
MINAS GERAIS  
2022

## INTRODUÇÃO

Neste relatório vamos abordar sobre os circuitos combinacionais, que são aqueles constituídos por um conjunto de portas lógicas, as quais determinam os valores das saídas diretamente a partir dos valores atuais das entradas. Com o uso do datasheet de cada porta lógica, iremos montar um circuito, usando fios e as chaves seletoras. Também iremos observar seu comportamento lógico, bem como extrair a sua tabela verdade de acordo com as saídas no Led ( ou seja, apagado ou aceso, 0 ou 1) e a sua expressão booleana.

## DESENVOLVIMENTO

**Prática 01:** Tivemos que montar o seguinte circuito:



As portas lógicas usadas foram NOT, NOR e NAND. As equações booleanas para cada saída ficaram assim:

$$S = \overline{(A.B) + C}$$

$$T = \overline{(A + B). (A.C)}$$

Tabela verdades das portas usadas no circuito:

NOT			NAND			NOR		
A	X		A	B	X	A	B	X
0	1		0	0	1	0	0	1
1	0		0	1	1	0	1	0
			1	0	1	1	0	0
			1	1	0	1	1	0

E a tabela verdade do circuito:

	Entradas			Saídas	
	A	B	C	S	T
0	0	0	0	1	1
1	0	0	1	1	1
2	0	1	0	1	0
3	0	1	1	1	1
4	1	0	0	1	0
5	1	0	1	1	0
6	1	1	0	0	0
7	1	1	1	1	0

A, B e C => Entradas

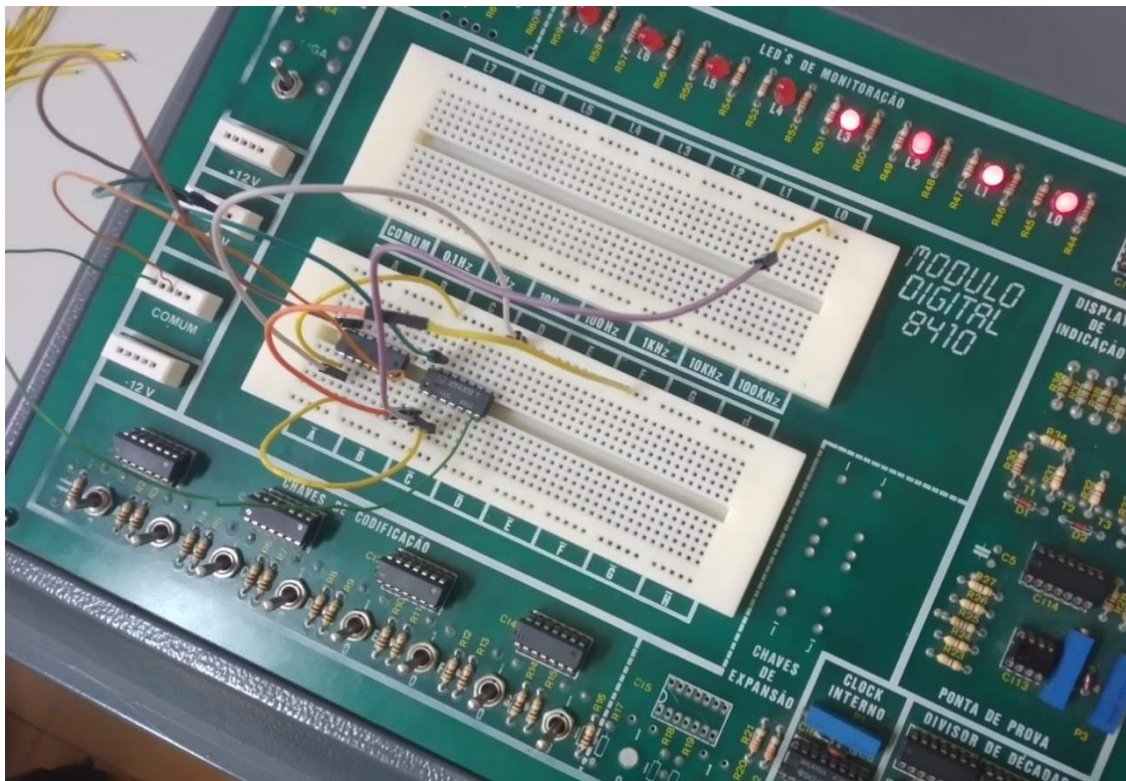
S e T => Saídas

Montamos o circuito da saída S no protoboard e a saída T no tinkercad. Abaixo os resultados de cada saída.

### Saída S:

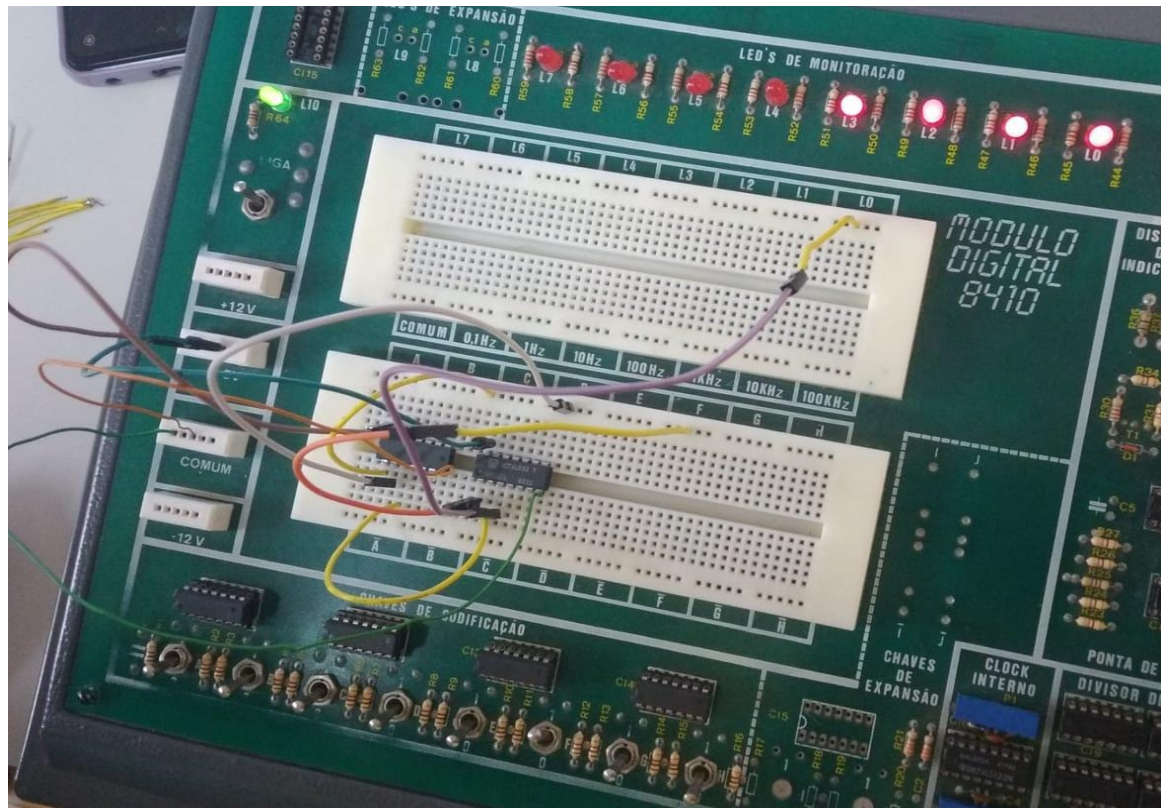
Obs.: Usamos o Led 0 (L0)

### CASO 000: LED 0 (L0)

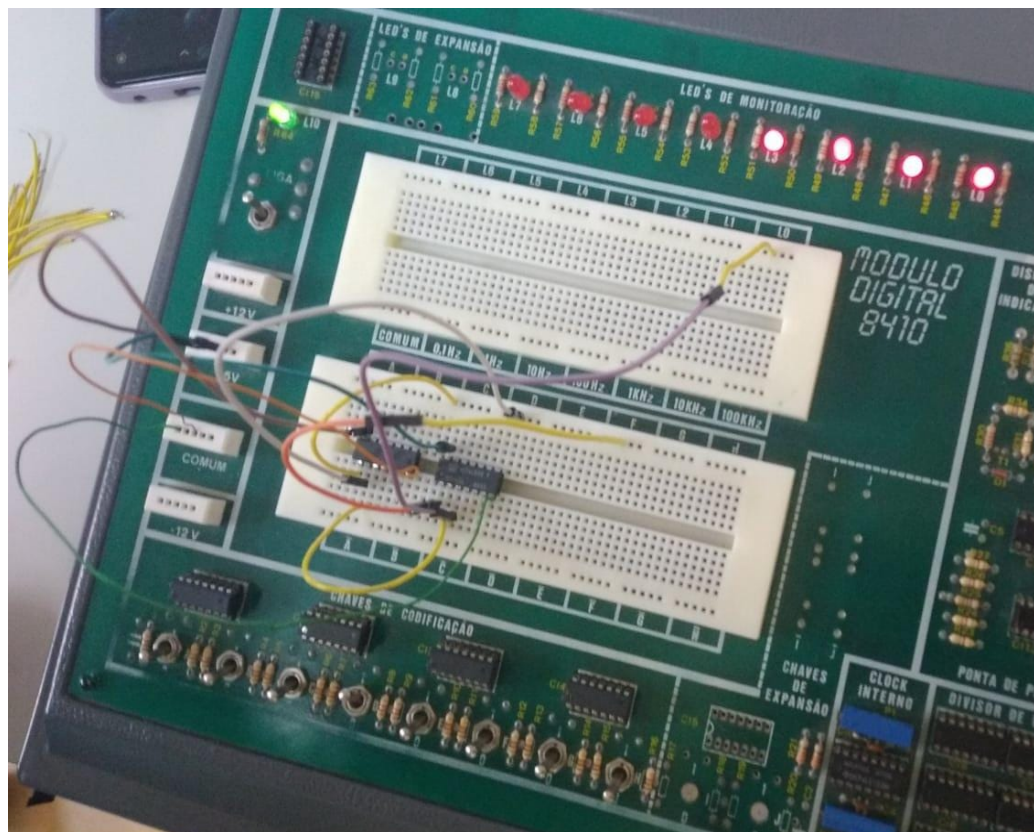




## CASO 001:

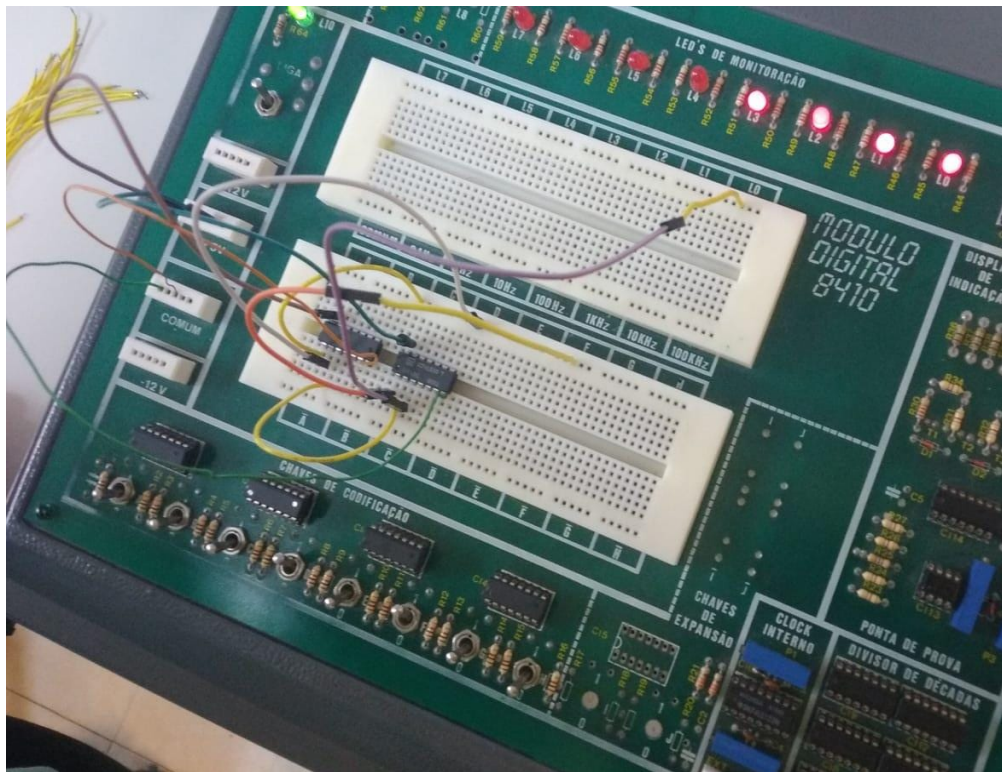


## CASO 010:

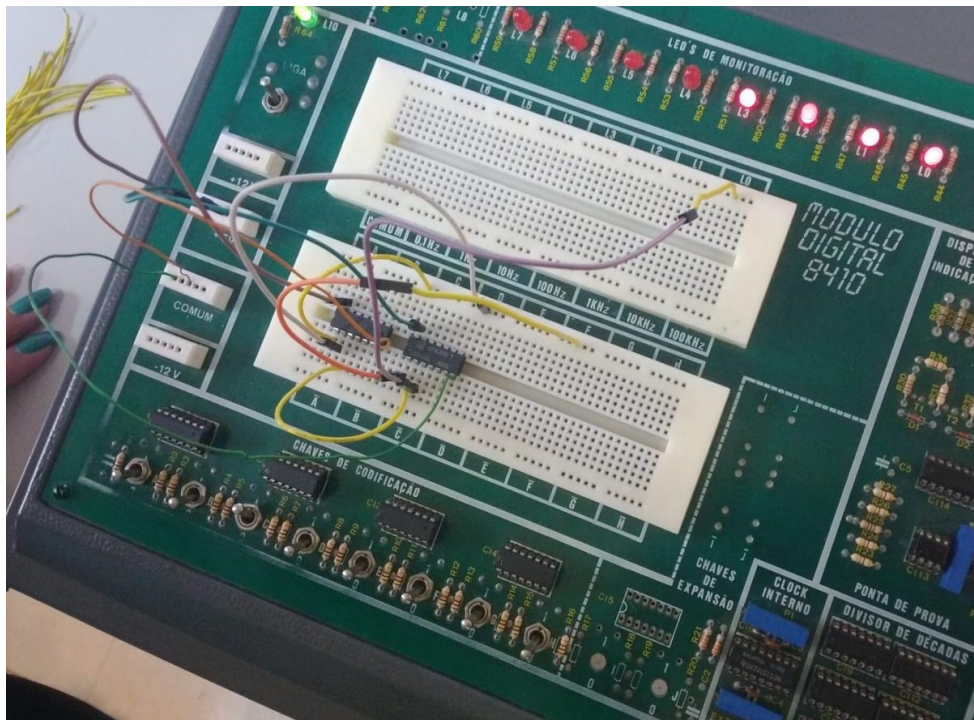




## CASO 011:

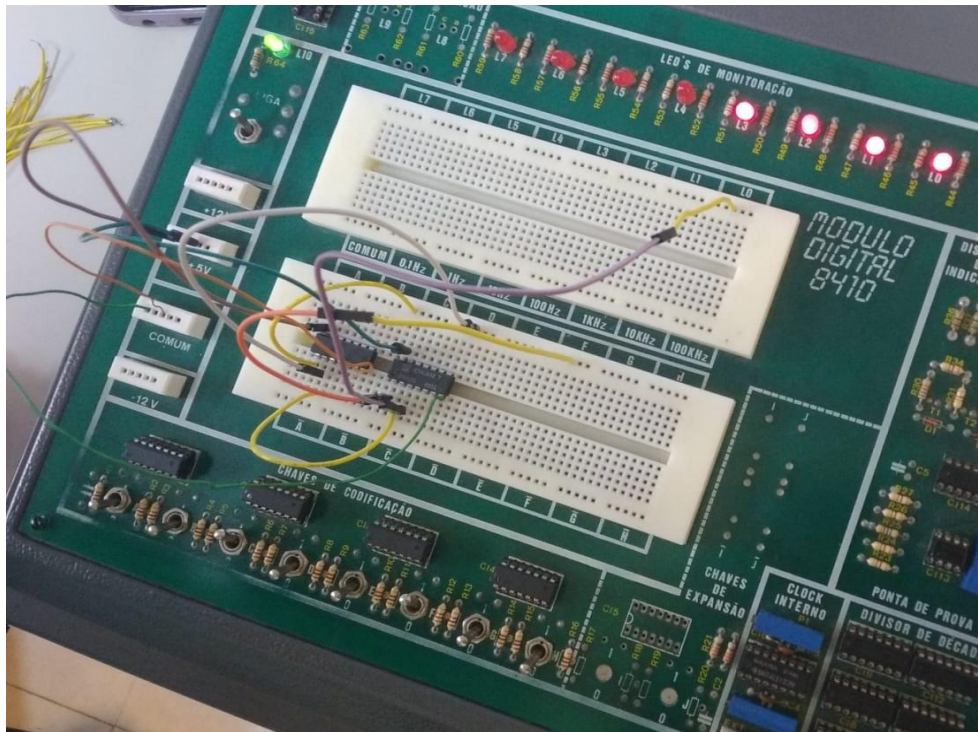


## CASO 100:

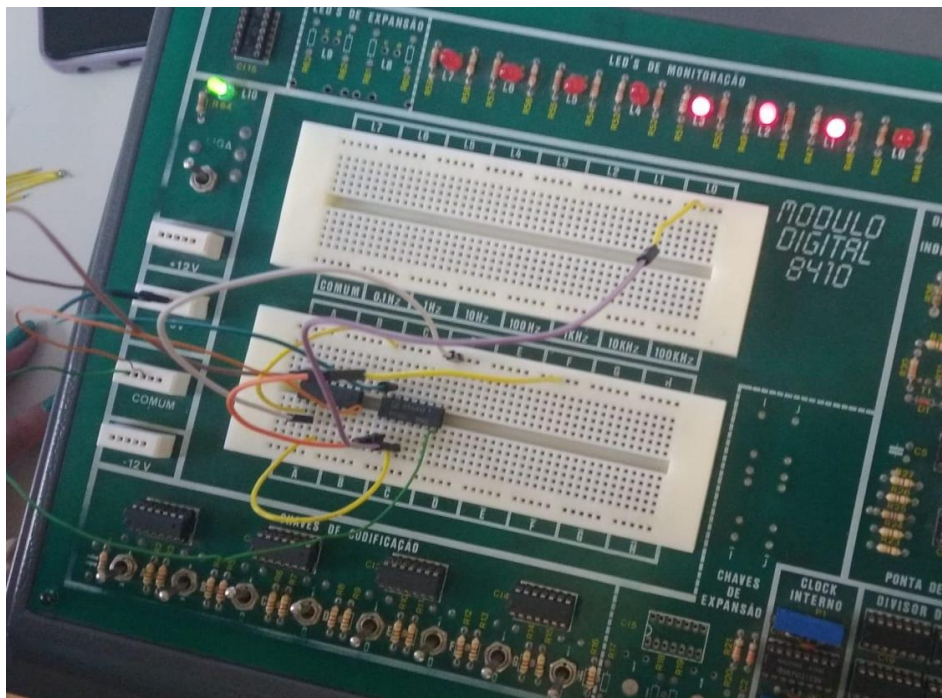


## CASO 101:

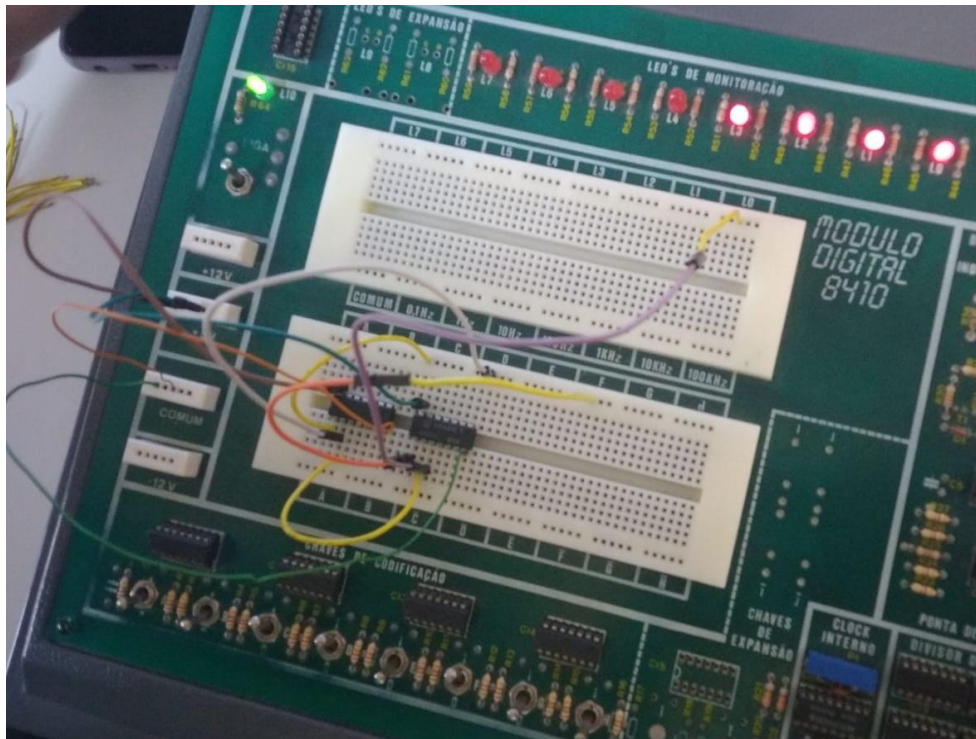




**CASO 110:**

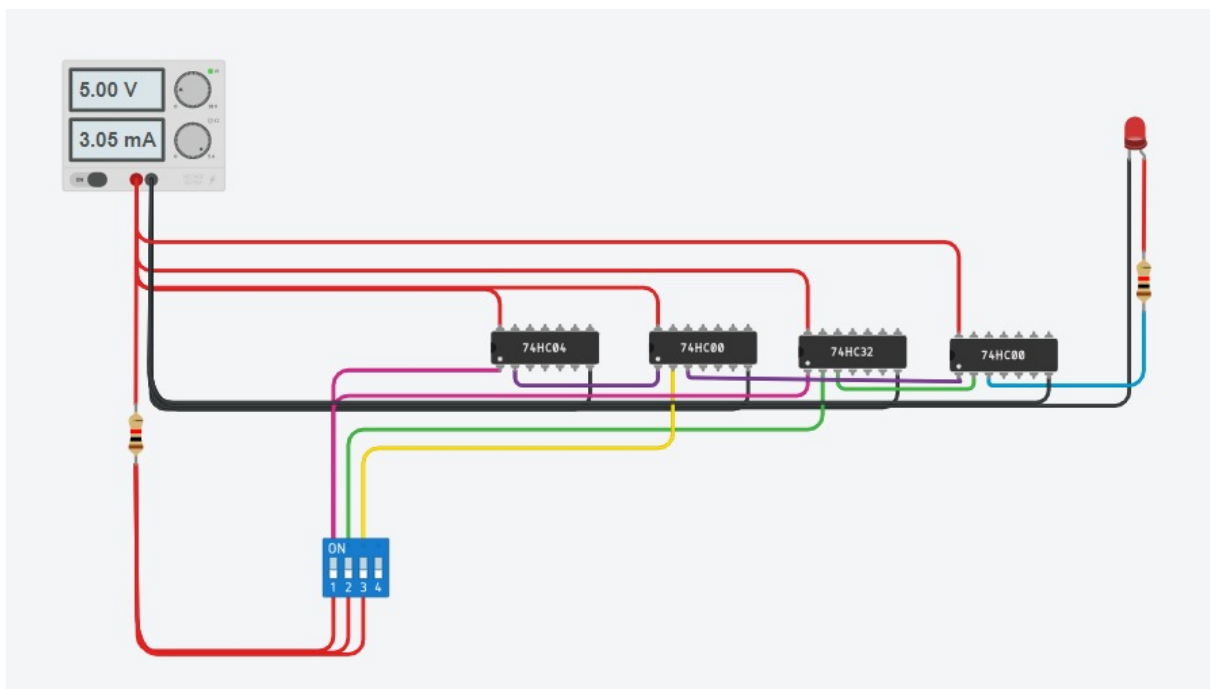


**CASO 111:**



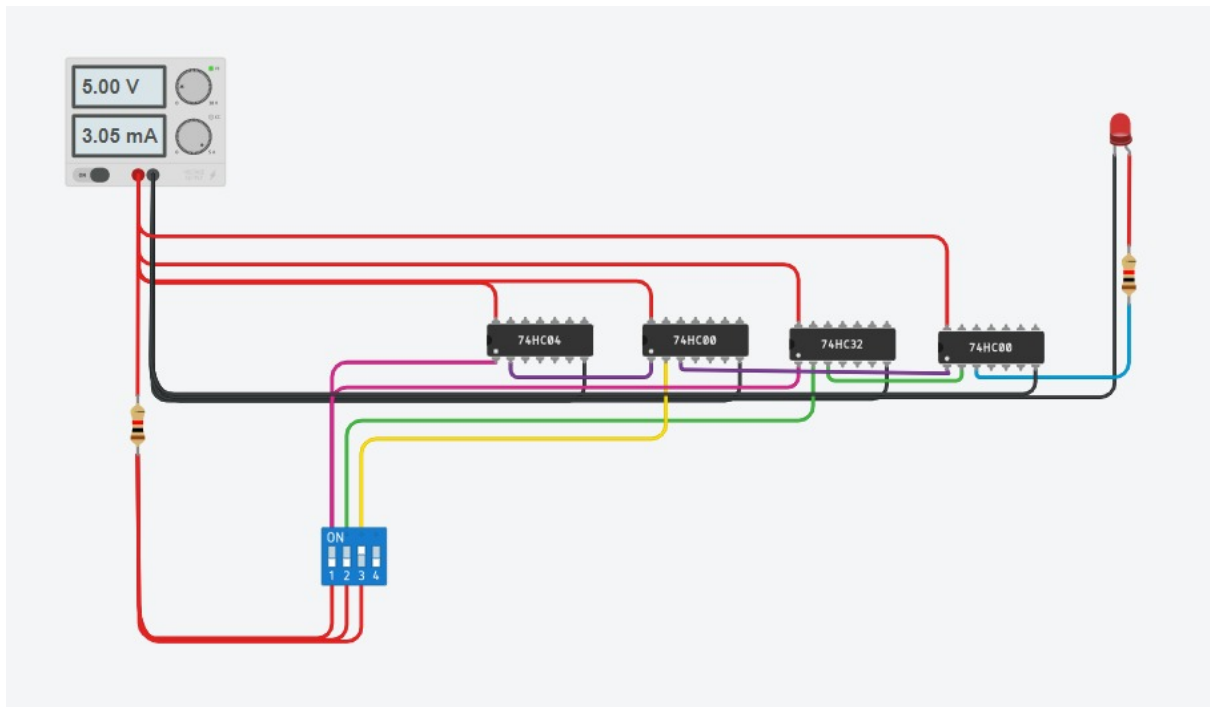
Saída T:

CASO 000:

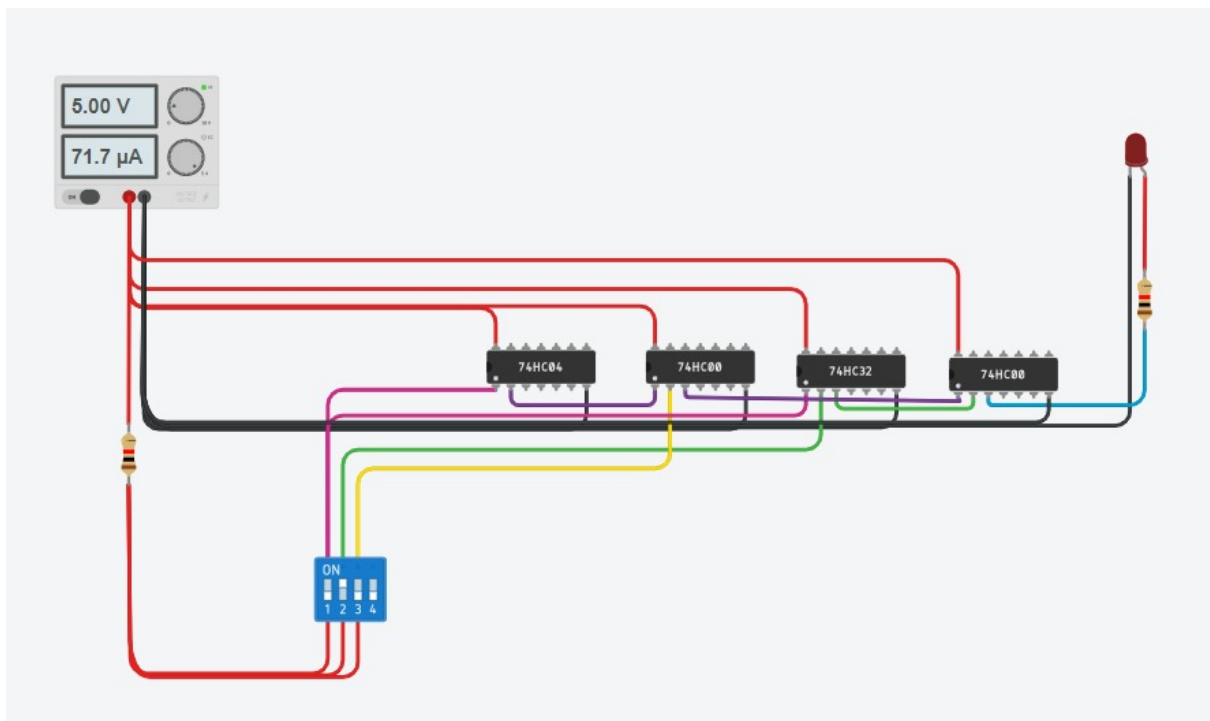




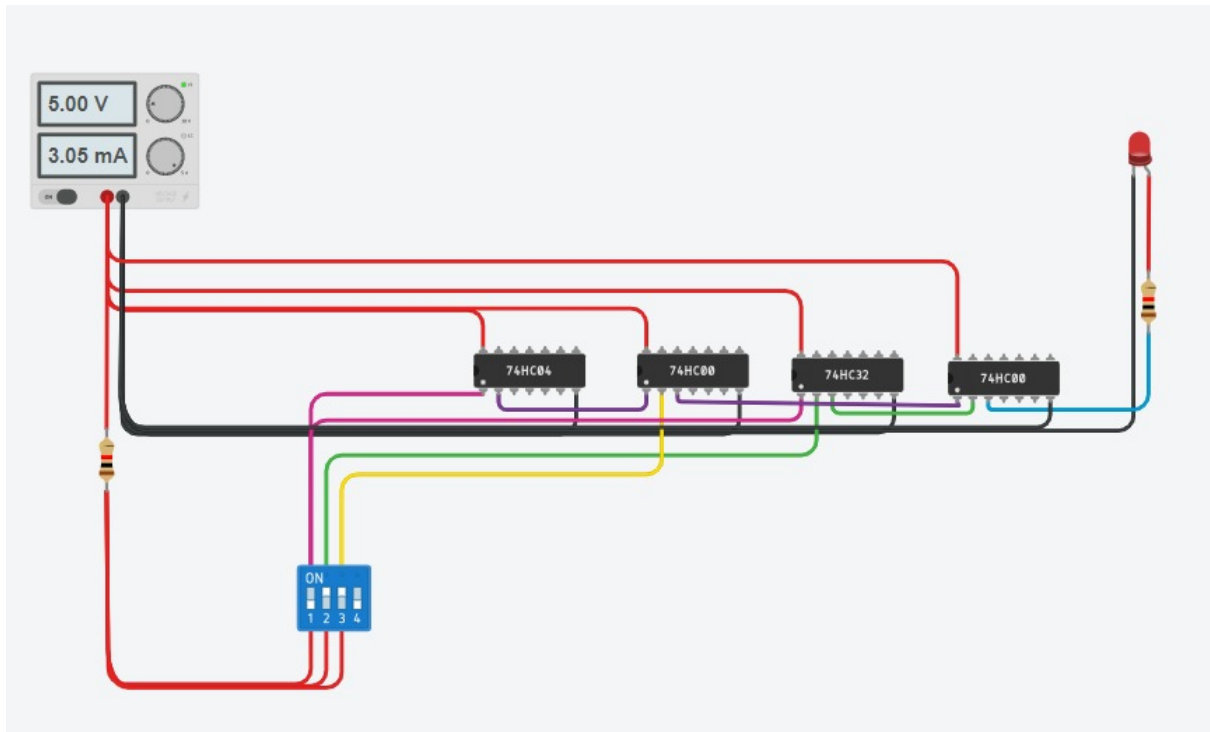
## CASO 001:



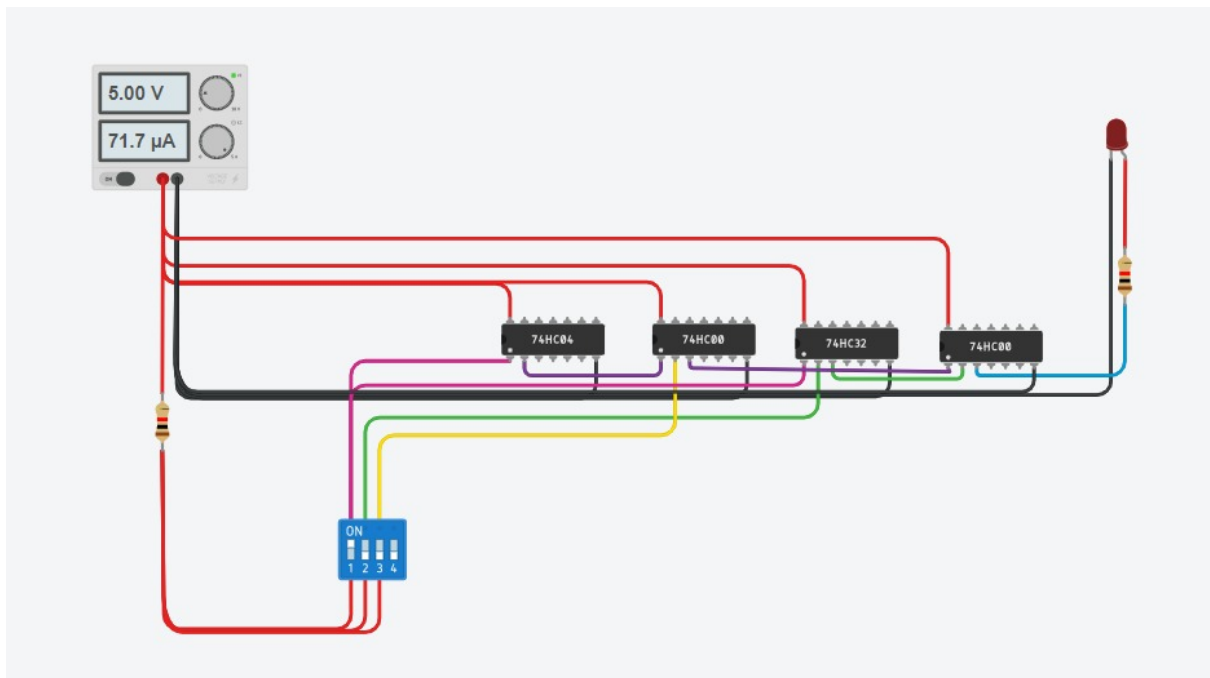
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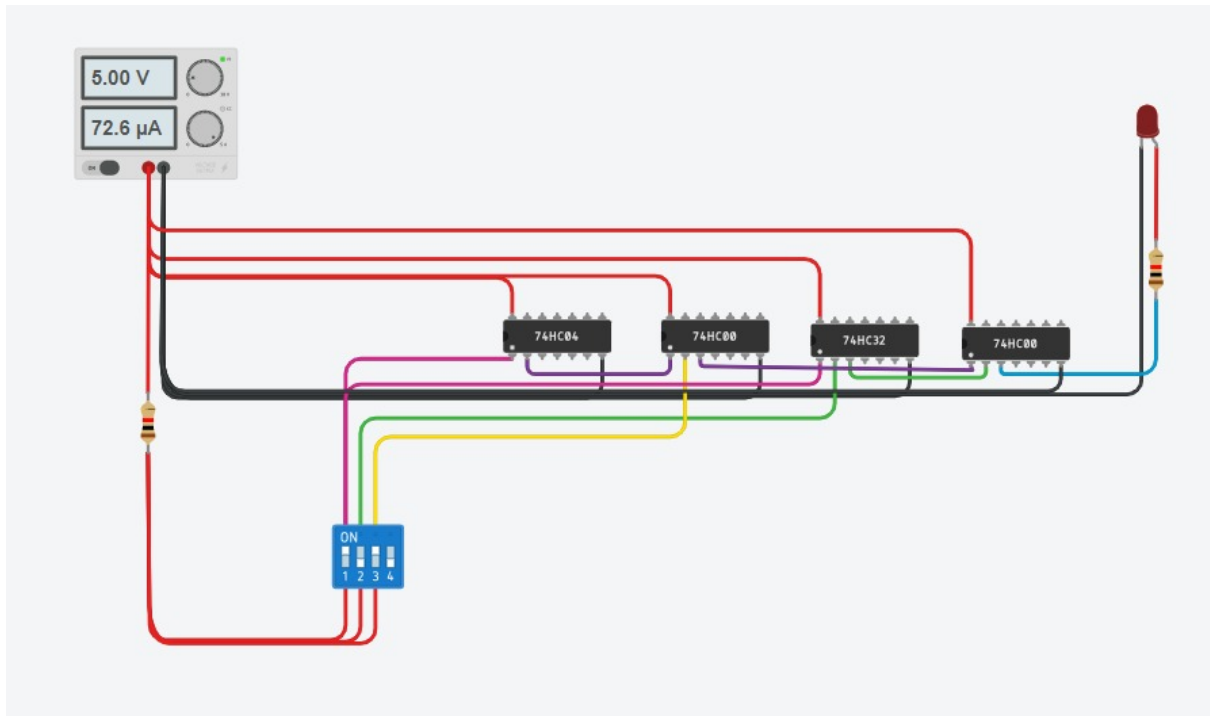
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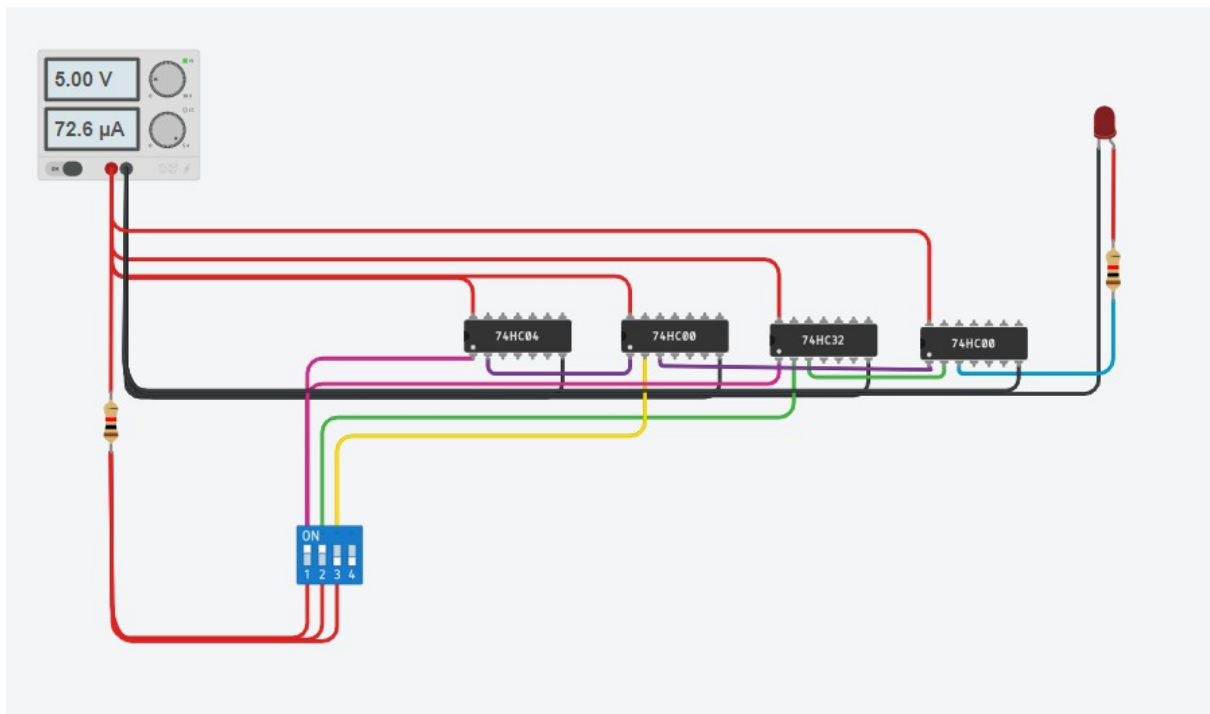
**CASO 100:**



**CASO 101:**

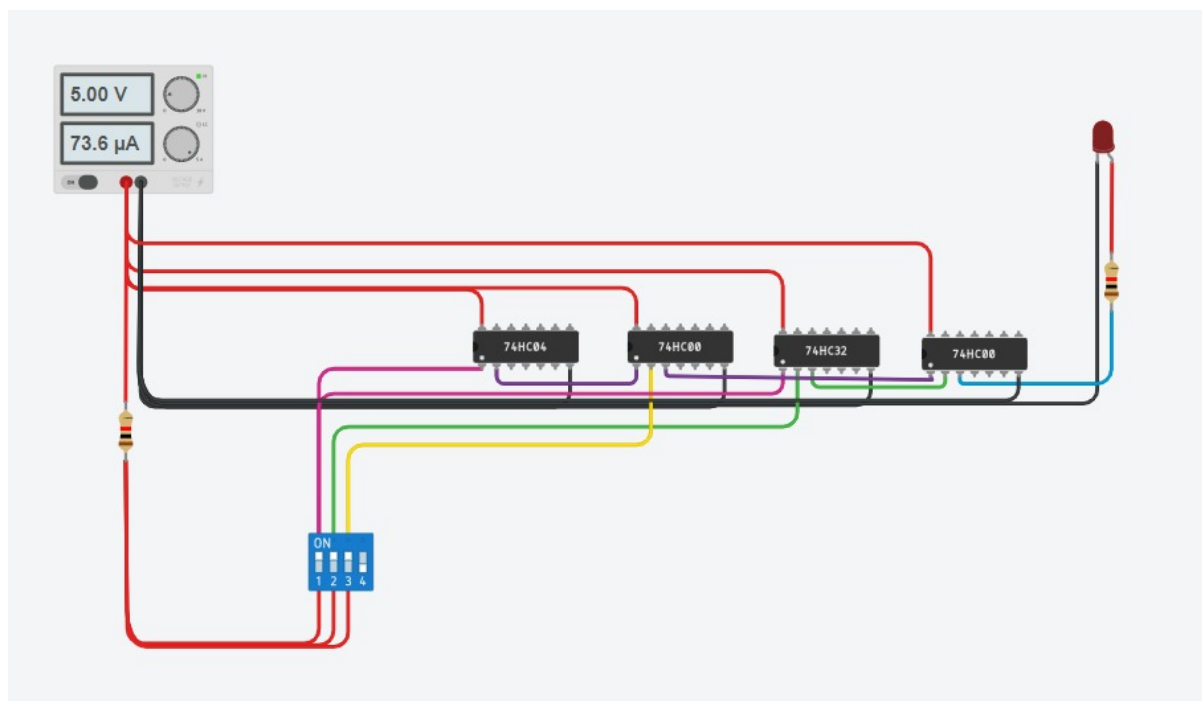


**CASO 110:**



**CASO 111:**





A saída S e T estão com os resultados iguais ao da tabela verdade.

**Prática 02:** Montamos no tinkercad um circuito combinacional que a partir de 4 entradas A, B, C e D, produzia uma saída S. Fizemos primeiro a tabela verdade, abaixo:

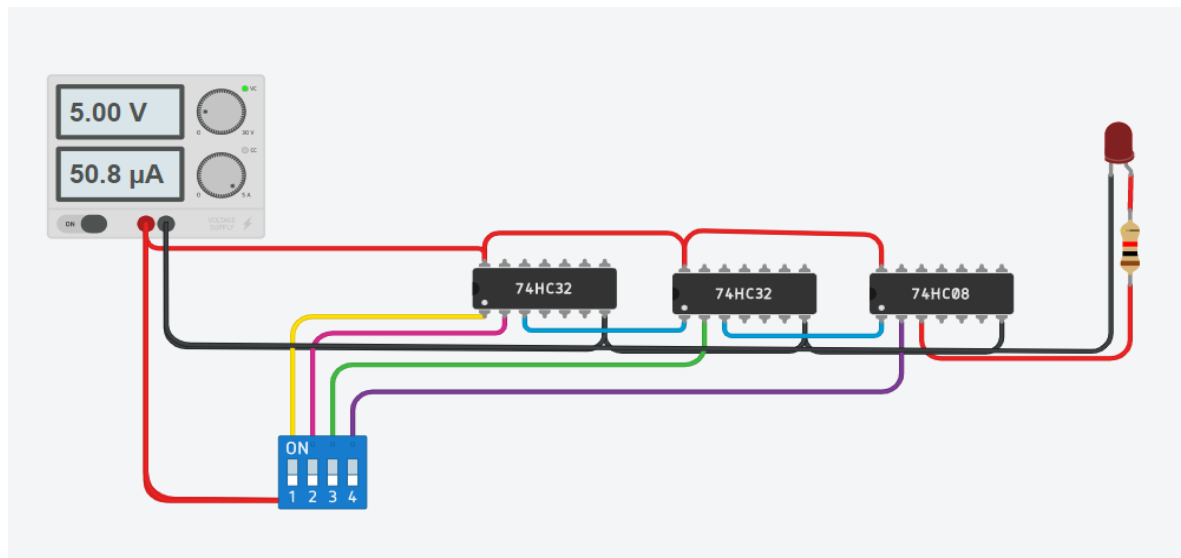
A	B	C	D	S
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

A, B, C e D => Entradas

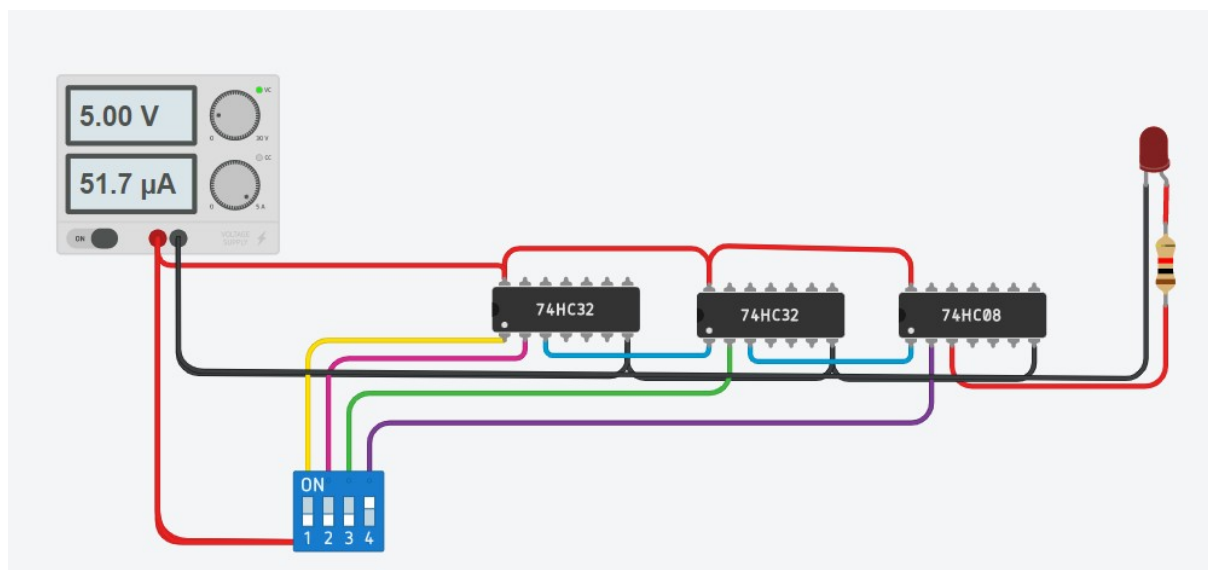
S => Saídas

Abaixo os resultados do circuito.

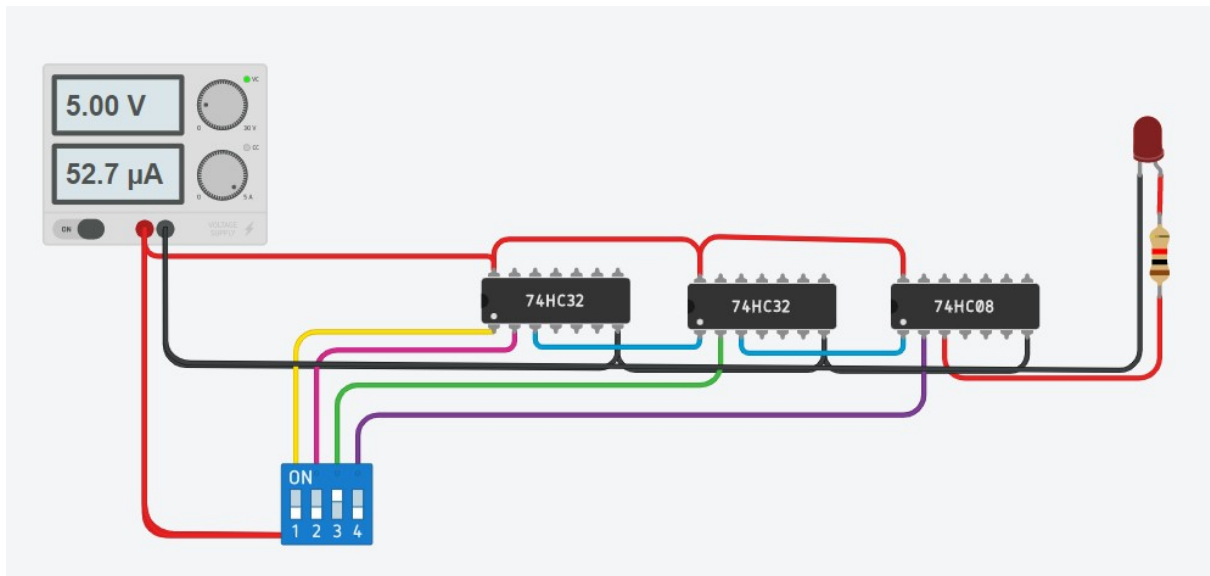
### CASO 0000:



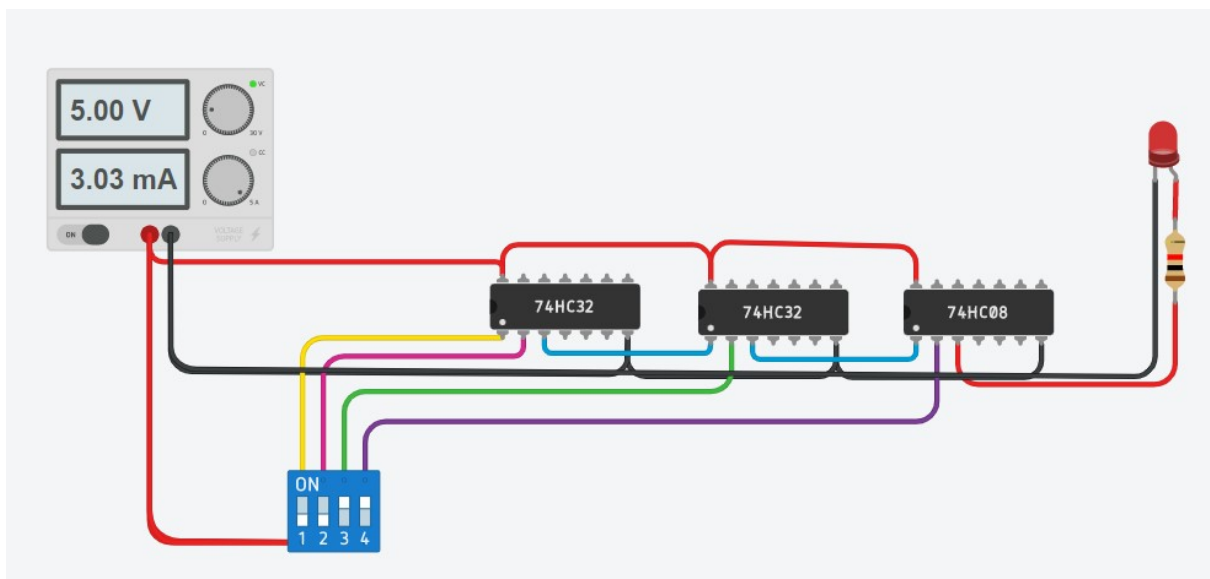
### CASO 0001:



### CASO 0010:

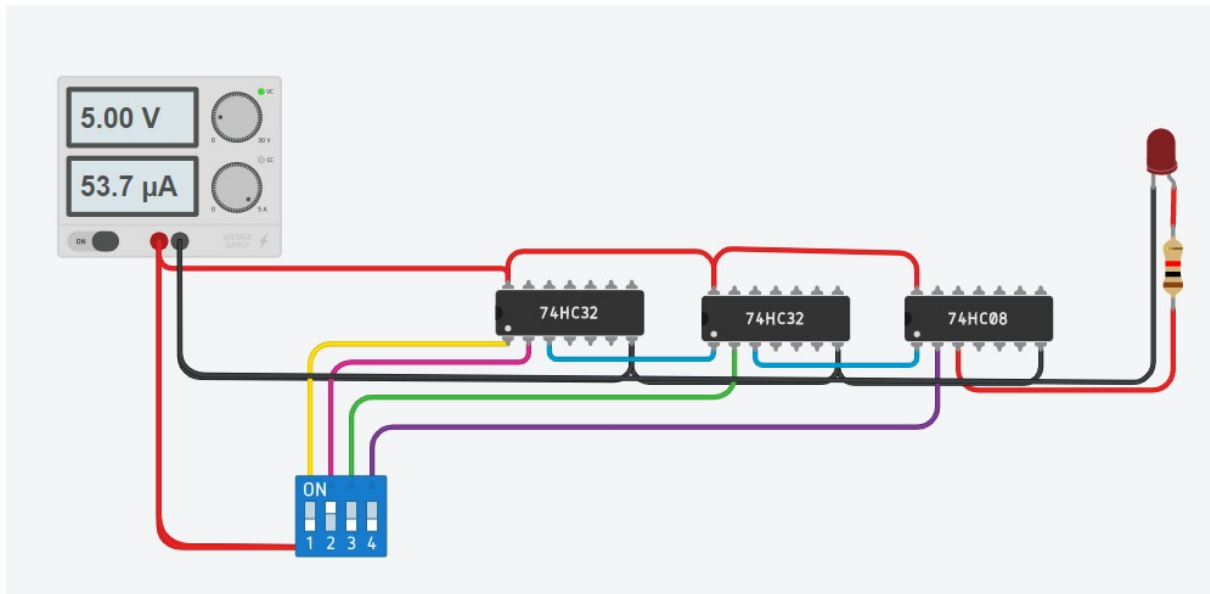


### CASO 0011:

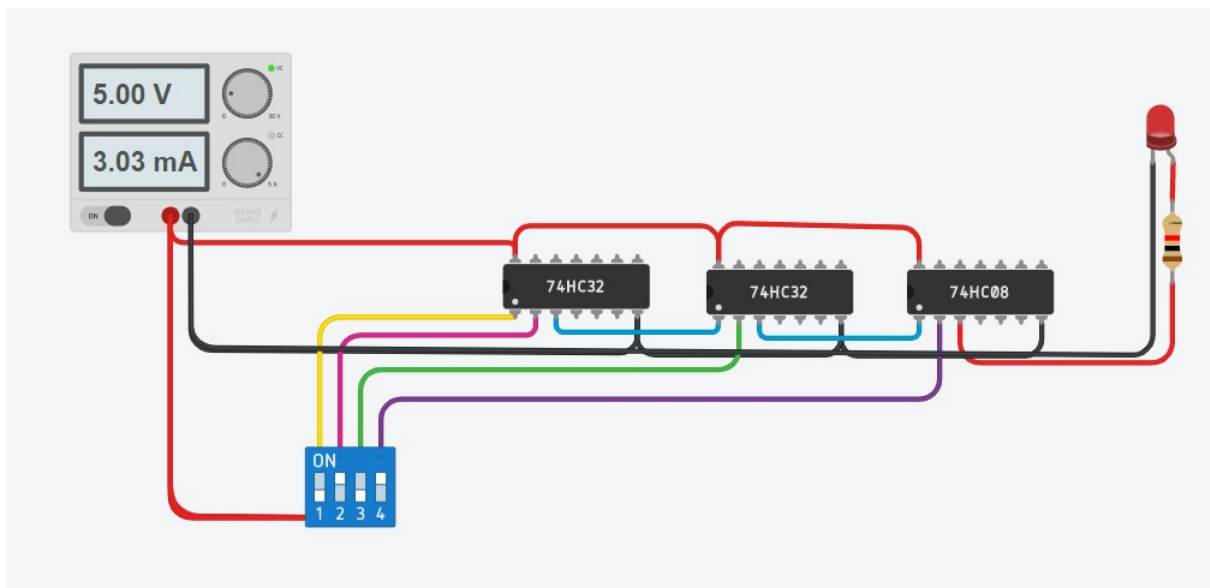


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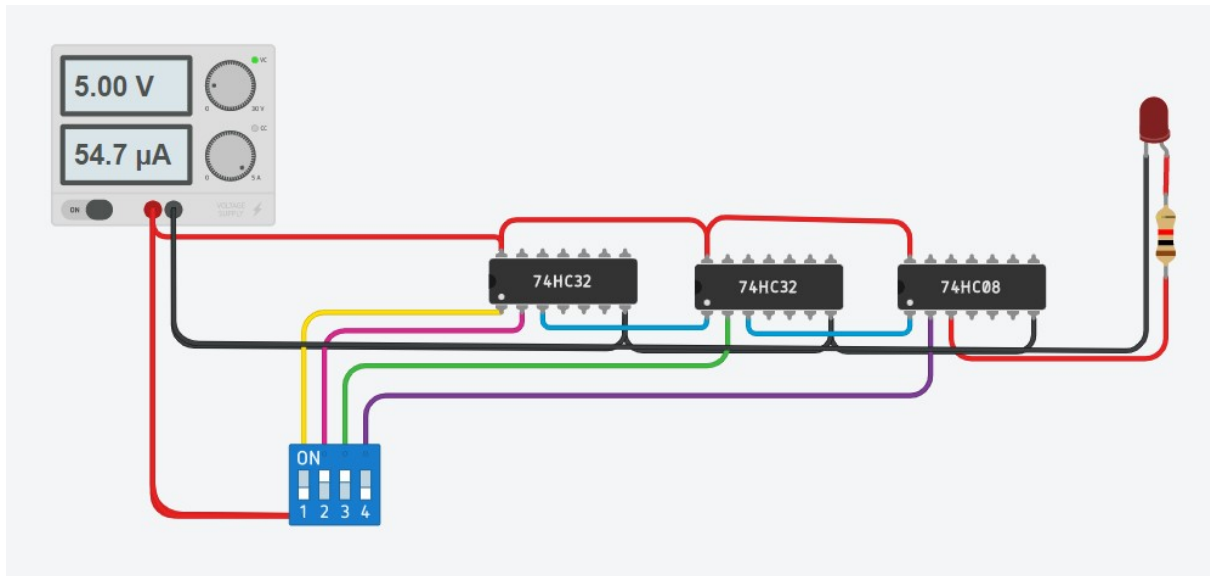




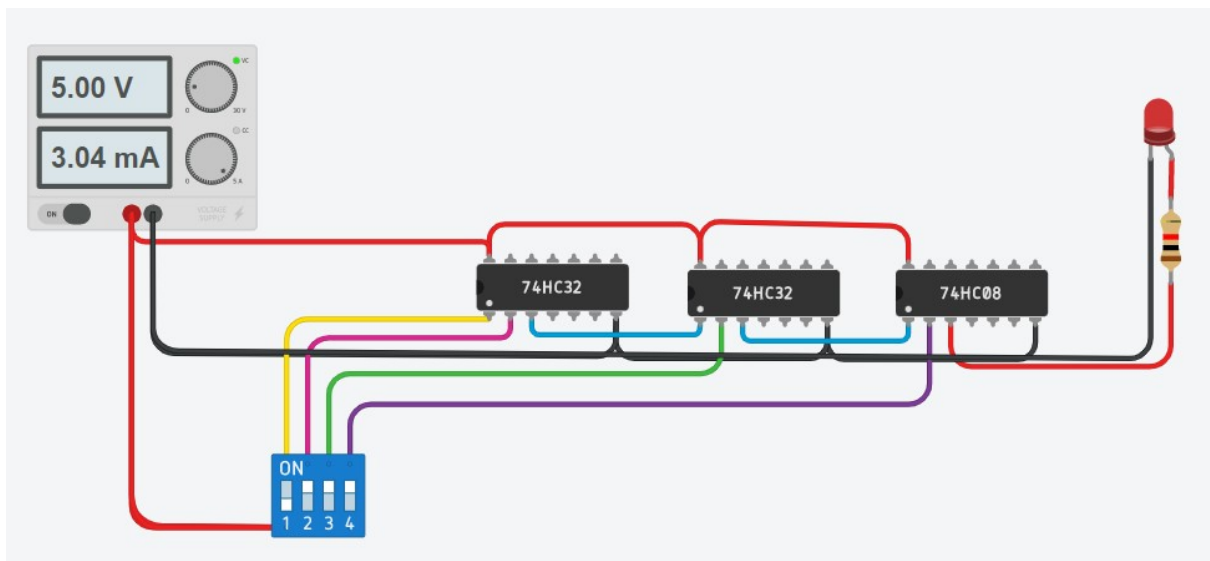
**CASO 0101:**



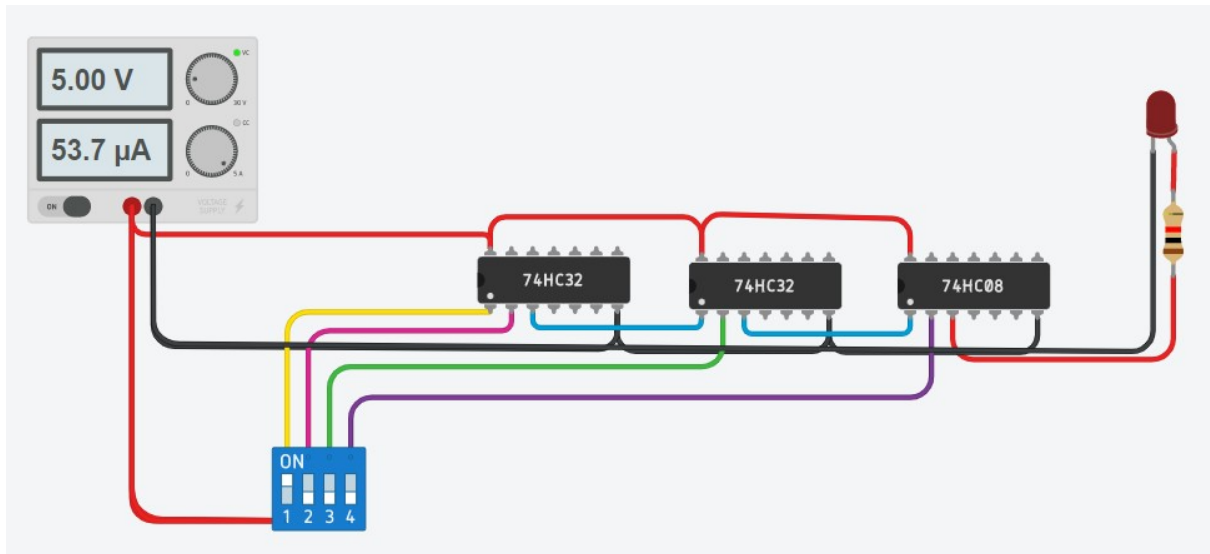
**CASO 0110:**



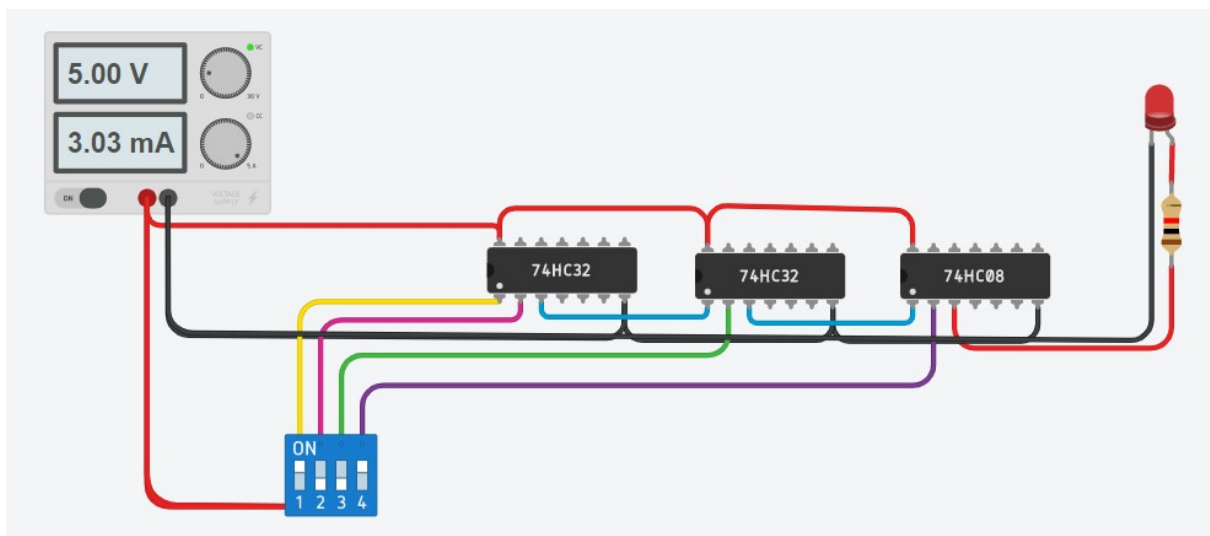
**CASO 0111:**



**CASO 1000:**

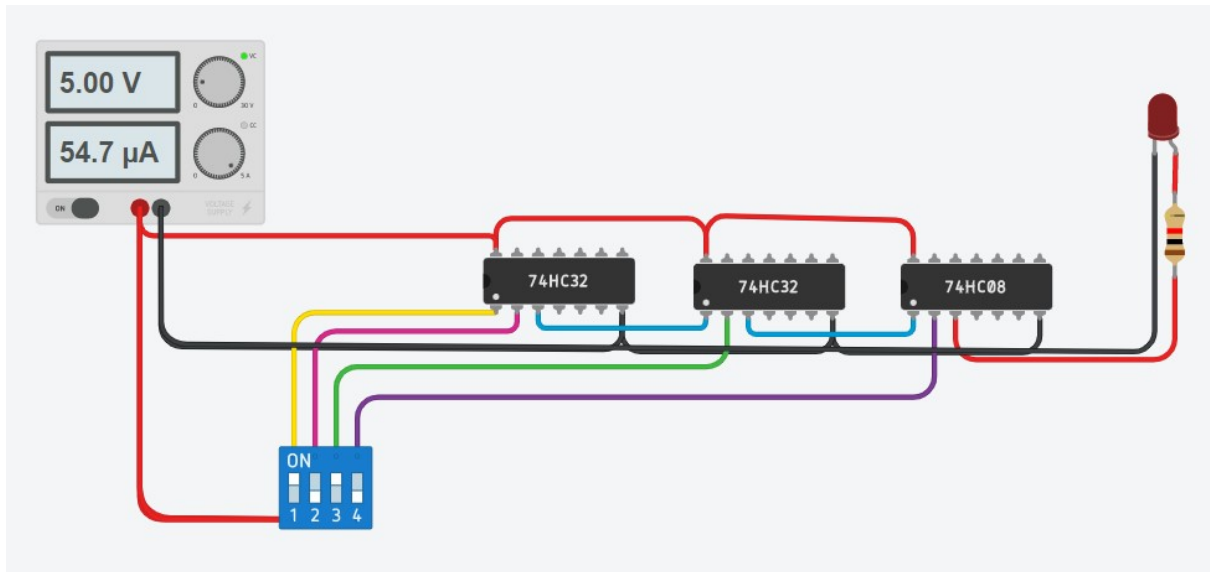


**CASO 1001:**

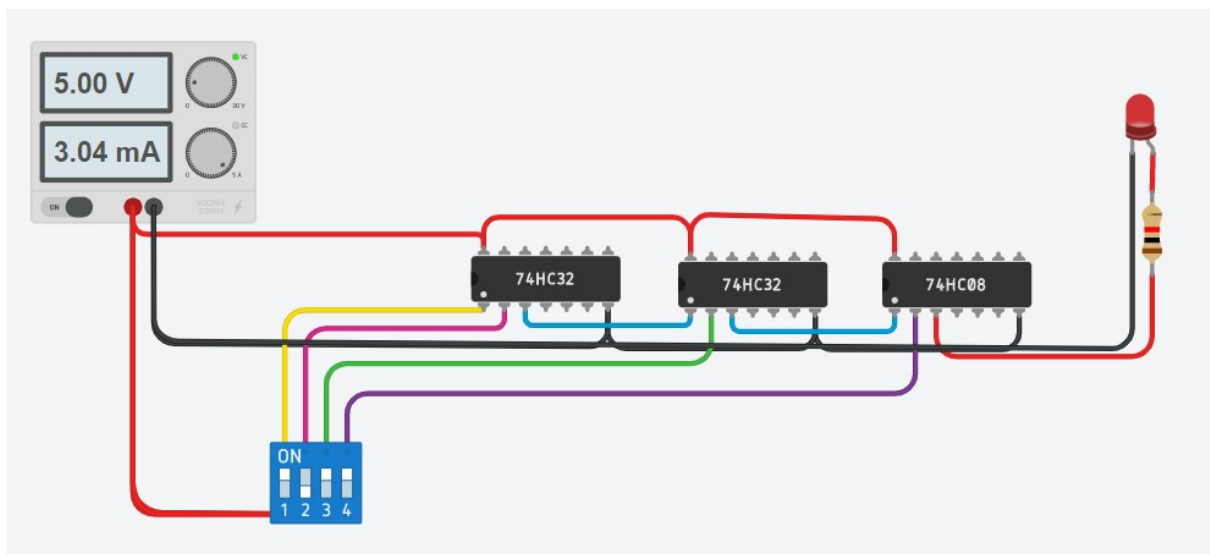


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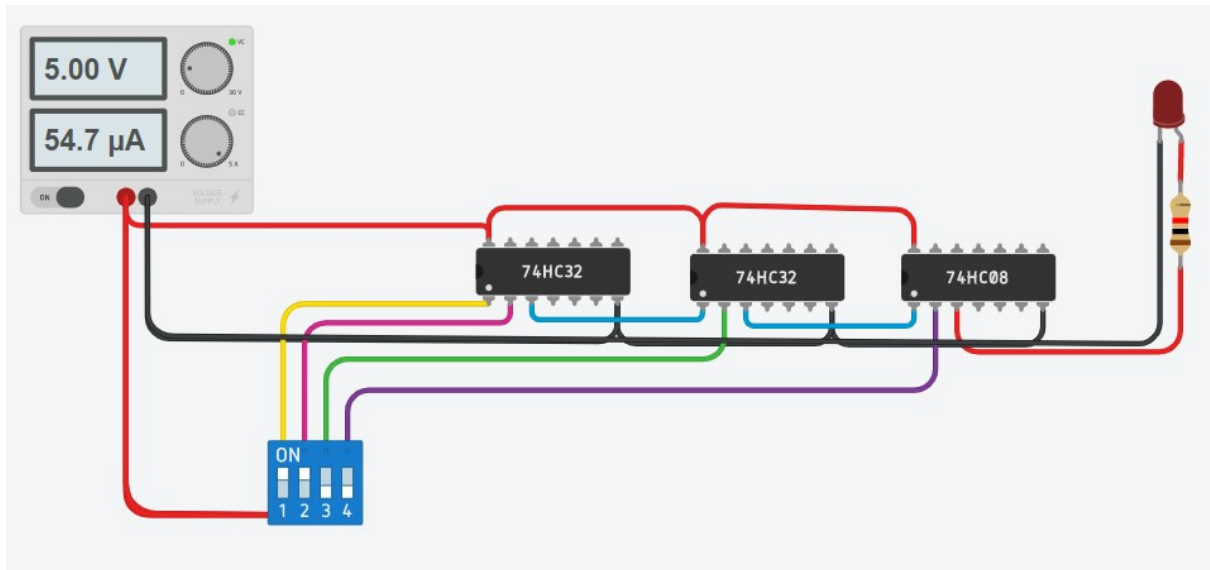




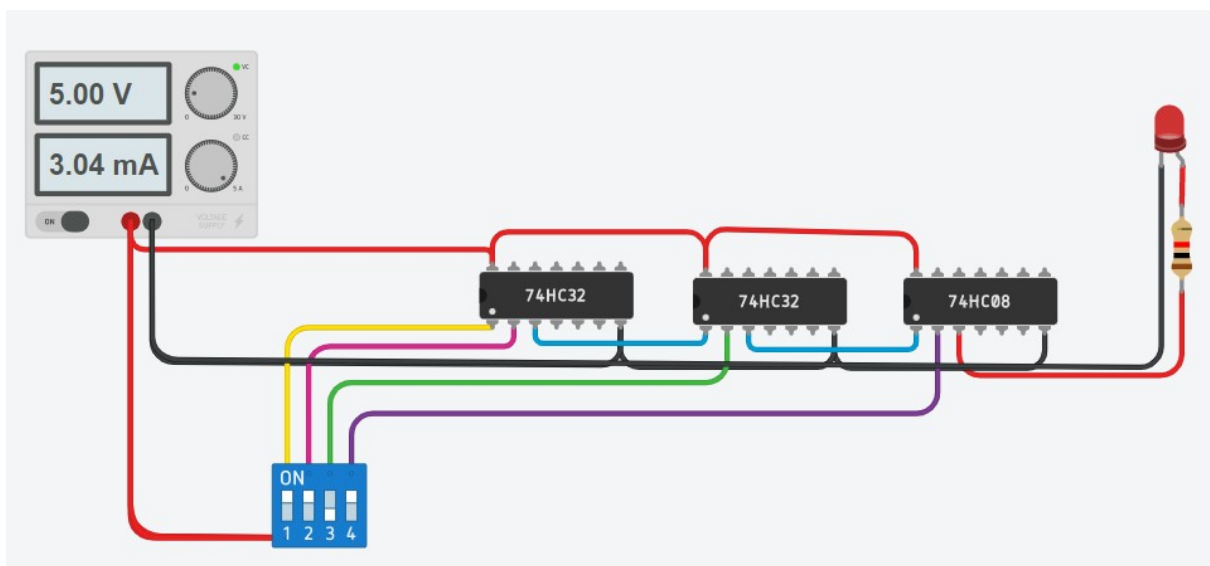
**CASO 1011:**



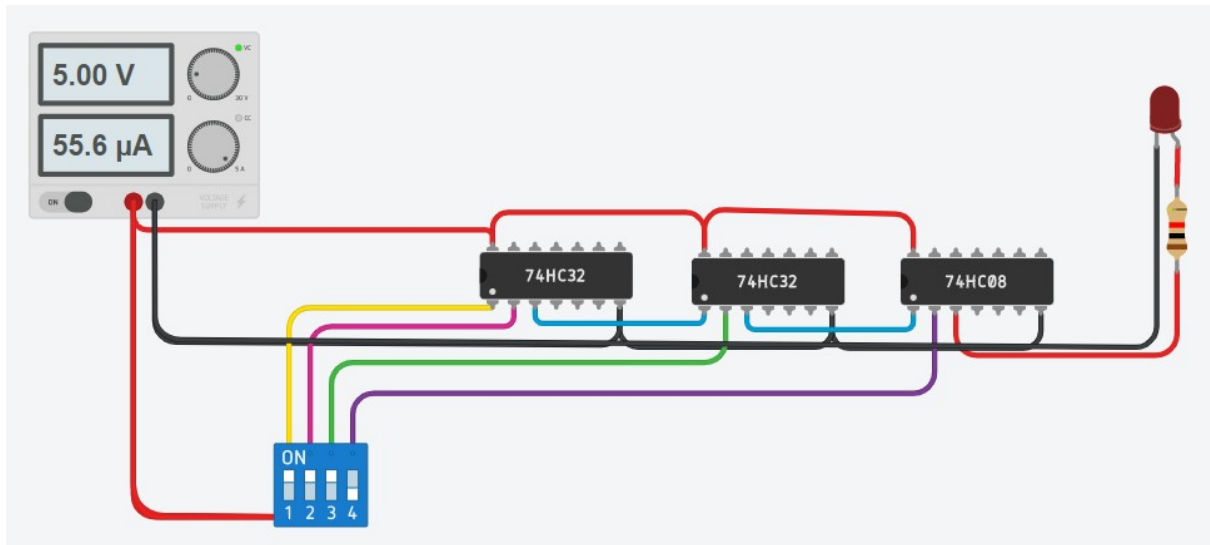
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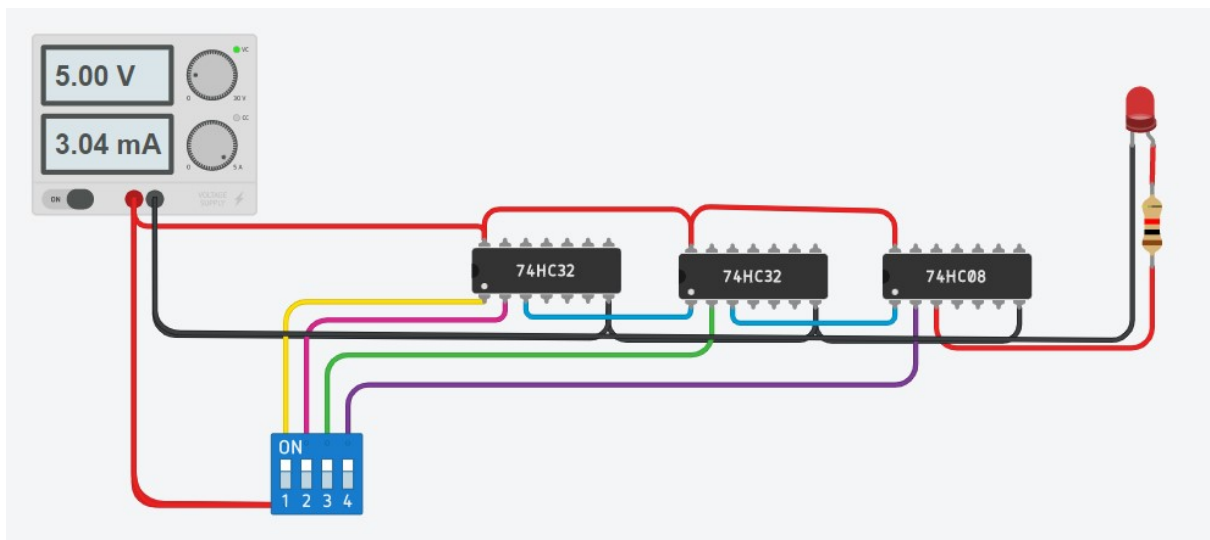
**CASO 1101:**



**CASO 1110:**



**CASO 1111:**





## **CONCLUSÃO:**

Ao realizarmos este relatório, conhecemos e aprendemos um pouco sobre os circuitos combinacionais, conseguimos provar que a tabela verdade extraída é semelhante com o resultado observado no Led. Compreendemos a funcionalidade das portas lógicas universais, conhecidas como o conjunto mínimo de portas capazes de gerar qualquer outra função lógica combinacional. Por fim, concluímos que este relatório foi importante para nosso aprendizado.