

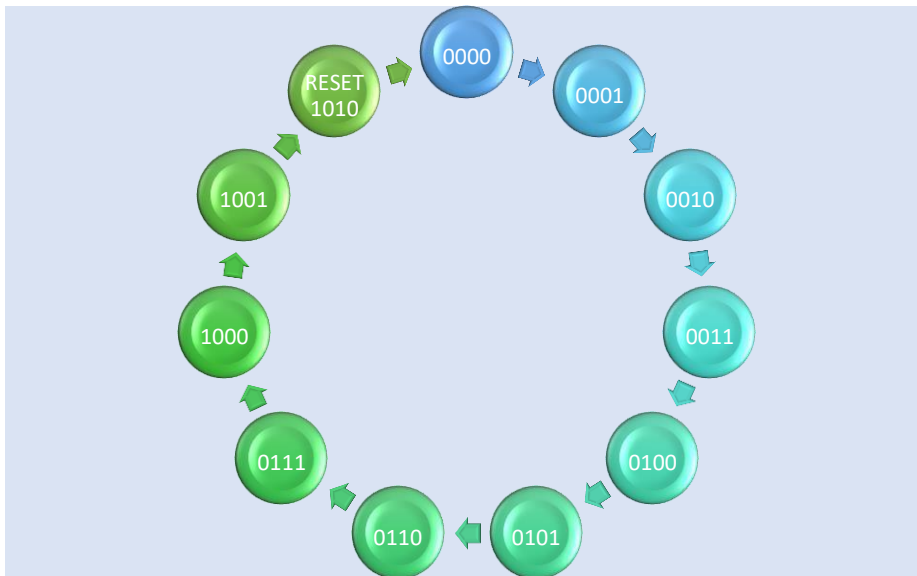
## LABORATORIO LOGICA SECUENCIAL

### PROBLEMA 1

Diseñe un Contador del 0 al 9. Usar el FF JK

Incluya:

- Tabla de Verdad y de Excitación.
- Diagramas de Estados.
- Diagramas Lógicos.
- Simulación (LiveWire, Multisim)



	ESTADO PRESENTE				X	ESTADO FUTURO												KD
	A	B	C	D		A	B	C	D		JA	KA	JB	KB	JC	KC	JD	
0	0	0	0	0	0	0	0	0	0		0	X	0	X	0	X	0	X
	0	0	0	0	1	0	0	0	1		0	X	0	X	0	X	1	X
1	0	0	0	1	0	0	0	0	1		0	X	0	X	0	X	X	0
	0	0	0	1	1	0	0	1	0		0	X	0	X	1	X	X	1
2	0	0	1	0	0	0	0	1	0		0	X	0	X	X	0	0	X
	0	0	1	0	1	0	0	1	1		0	X	0	X	X	0	1	X
3	0	0	1	1	0	0	0	1	1		0	X	0	X	X	0	X	0
	0	0	1	1	1	0	1	0	0		0	X	1	X	X	1	X	1
4	0	1	0	0	0	0	1	0	0		0	X	X	0	0	X	0	X
	0	1	0	0	1	0	1	0	1		0	X	X	0	0	X	1	X
5	0	1	0	1	0	0	1	0	1		0	X	X	0	0	X	X	0
	0	1	0	1	1	0	1	1	0		0	X	X	0	1	X	X	1
6	0	1	1	0	0	0	1	1	0		0	X	X	0	X	0	0	X
	0	1	1	0	1	0	1	1	1		0	X	X	0	X	0	1	X
7	0	1	1	1	0	0	1	1	1		0	X	X	0	X	0	X	0
	0	1	1	1	1	1	1	0	0		1	X	X	1	X	1	X	1
8	1	0	0	0	0	0	1	0	0		X	0	0	X	0	X	0	X
	1	0	0	0	1	1	1	0	0	1		X	0	0	X	0	X	1
9	1	0	0	1	0	1	0	0	1		X	0	0	X	0	X	X	0
	1	0	0	1	1	1	1	0	1	0		X	0	0	X	1	X	1
RESETO	1	0	1	0	0	0	1	0	1	0		X	0	0	X	X	0	X
	1	0	1	0	1	0	0	0	0	0		X	1	0	X	X	1	X

Misma tabla pero por partes para que se entienda:

Entradas:

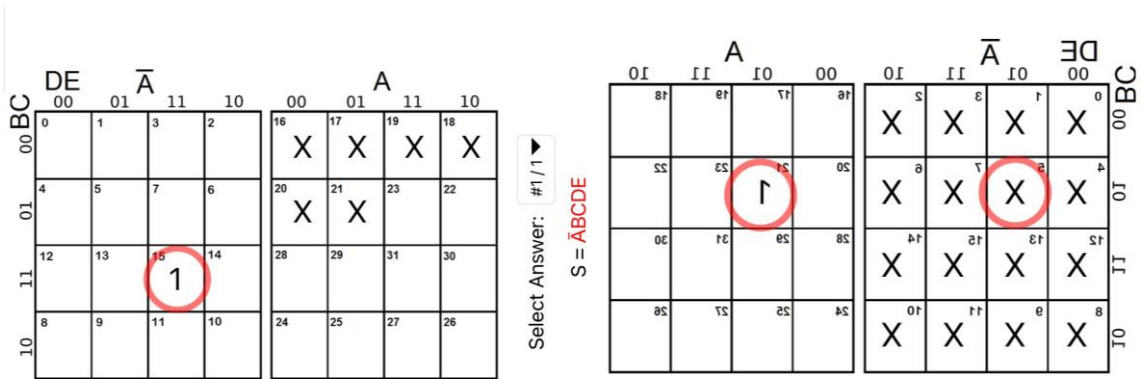
	ESTADO PRESENTE				X	ESTADO FUTURO				
	A	B	C	D		A	B	C	D	
0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	1	0	0	0	1	
1	0	0	0	1	0	0	0	0	1	
	0	0	0	1	1	0	0	1	0	
2	0	0	1	0	0	0	0	1	0	
	0	0	1	0	1	0	0	1	1	
3	0	0	1	1	0	0	0	1	1	
	0	0	1	1	1	0	1	0	0	
4	0	1	0	0	0	0	1	0	0	
	0	1	0	0	1	0	1	0	1	
5	0	1	0	1	0	0	1	0	1	
	0	1	0	1	1	0	1	1	0	
6	0	1	1	0	0	0	1	1	0	
	0	1	1	0	1	0	1	1	1	
7	0	1	1	1	0	0	1	1	1	
	0	1	1	1	1	1	0	0	0	
8	1	0	0	0	0	1	0	0	0	
	1	0	0	0	1	1	0	0	1	
9	1	0	0	1	0	1	0	0	1	
	1	0	0	1	1	1	0	1	0	
RESETEO	1	0	1	0	0	1	0	1	0	
	1	0	1	0	1	0	0	0	0	

## Salidas del flip flop

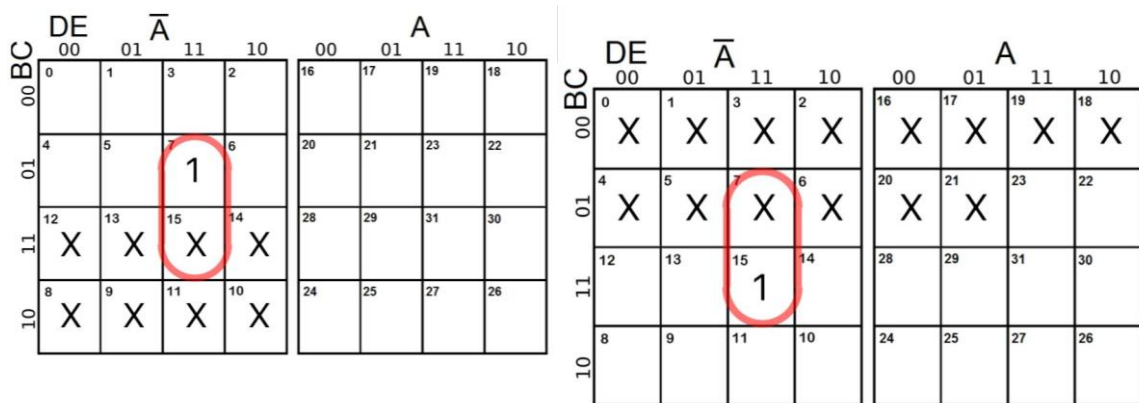
Salidas								
	JA	KA	JB	KB	JC	KC	JD	KD
	0	X	0	X	0	X	0	X
	0	X	0	X	0	X	1	X
	0	X	0	X	0	X	X	0
	0	X	0	X	1	X	X	1
	0	X	0	X	X	0	0	X
	0	X	0	X	X	0	1	X
	0	X	0	X	X	0	X	0
	0	X	1	X	X	1	X	1
	0	X	X	0	0	X	0	X
	0	X	X	0	0	X	1	X
	0	X	X	0	0	X	X	0
	0	X	X	0	1	X	X	1
	0	X	X	0	X	0	0	X
	0	X	X	0	X	0	1	X
	0	X	X	0	X	0	X	0
	0	X	X	0	X	0	X	0
	1	X	X	1	X	1	X	1
	X	0	0	X	0	X	0	X
	X	0	0	X	0	X	1	X
	X	0	0	X	0	X	X	0
	X	0	0	X	1	X	X	1
	X	0	0	X	X	0	0	X
	X	1	0	X	X	1	0	X

## KMaps y ecuaciones:

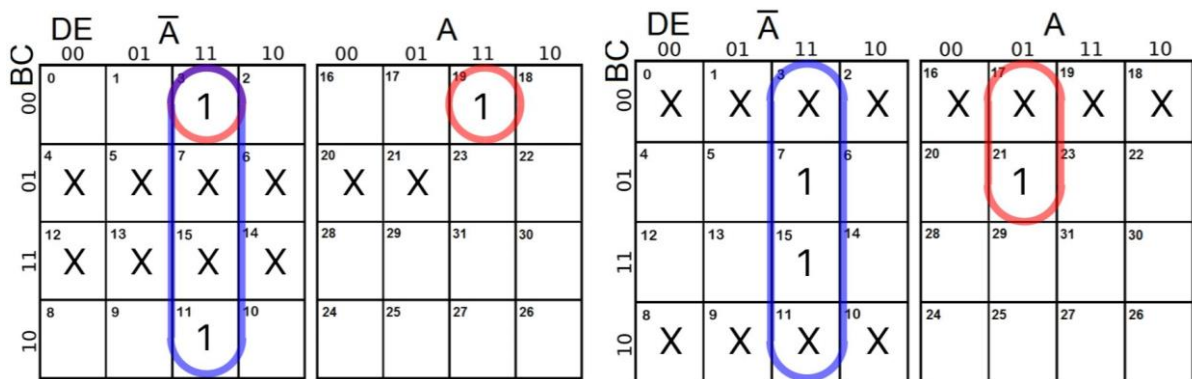
### Funcion JA y KA



### Funcion JB y KB



### Funcion JC y KC



## Funcion JD y KD

DE		$\bar{A}$				A		DE		$\bar{A}$				A		DE		$\bar{A}$				A	
		00	01	11	10					00	01	11	10					00	01	11	10		
BC	00	1	X	X		BC	00	1	X	X		BC	00	X	X	1		BC	00	X	X	1	
	01	1	X	X			01						01	X	X	1			01	X	X		
	11	1	X	X			11						11	X	X	1			11				
	10	1	X	X			10						10	X	X	1			10				

JA      $A'BCDX$

KA      $B'CD'X$

JB      $A'CDX$

KB      $A'CDX$

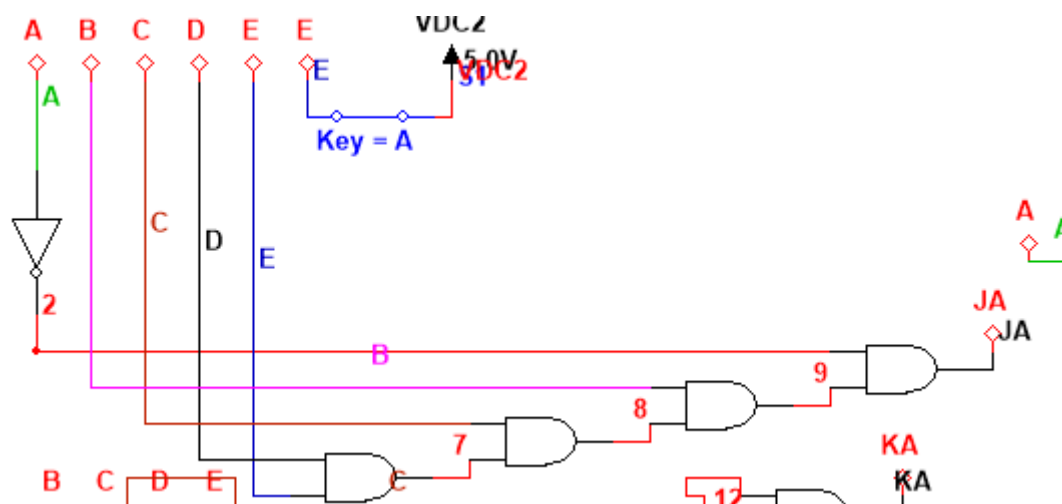
JC      $B'C'DX + A'DX$

KC      $AB'D'X + A'DX$

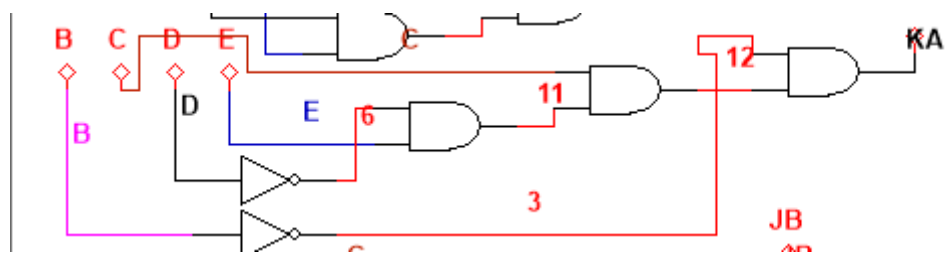
JD      $B'C'X + A'X$

KD      $B'C'X + A'X$

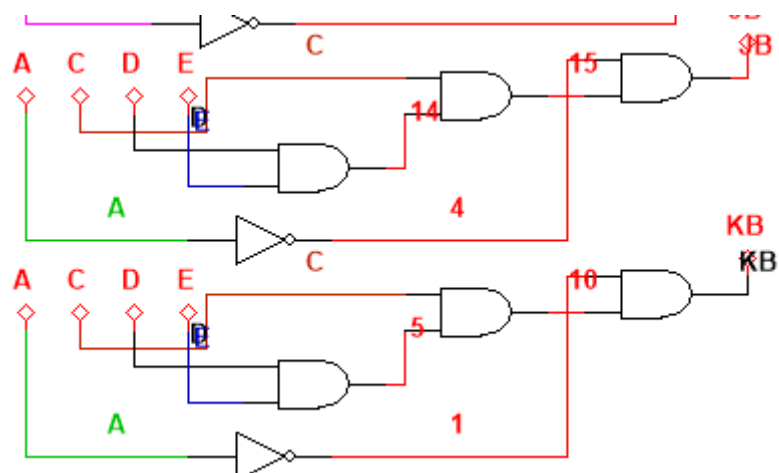
## Funcion JA



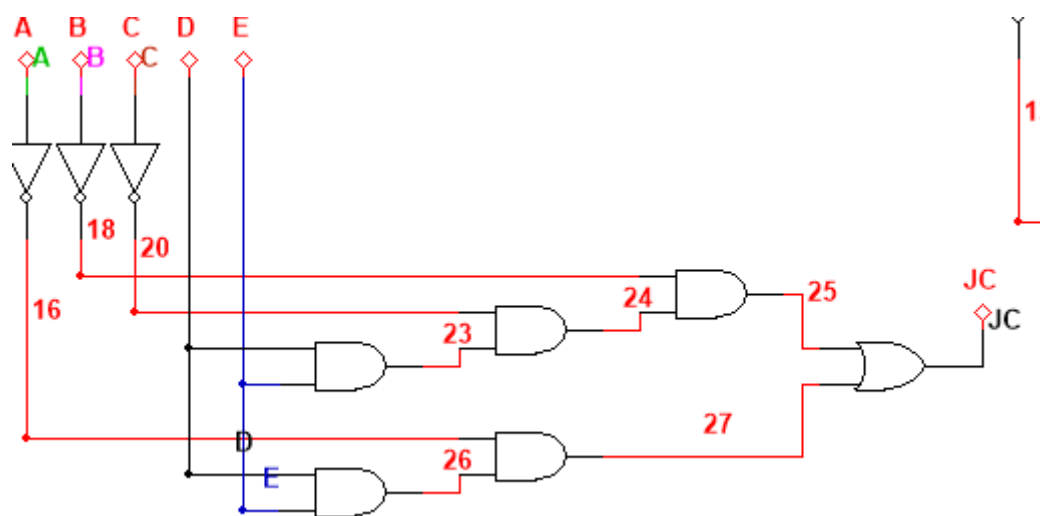
## Funcion KA

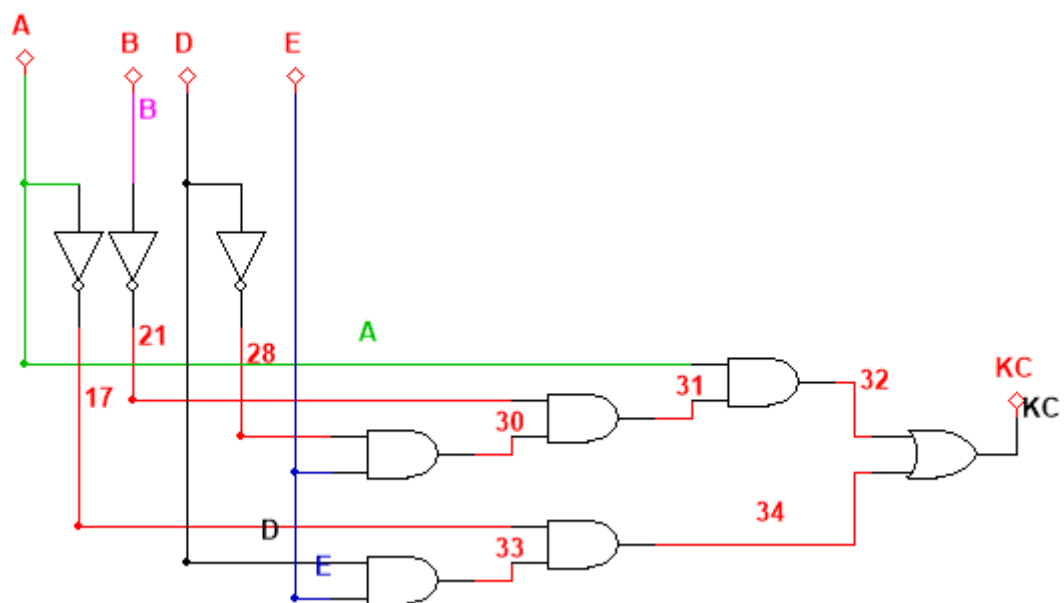


**Funcion JB y KB**

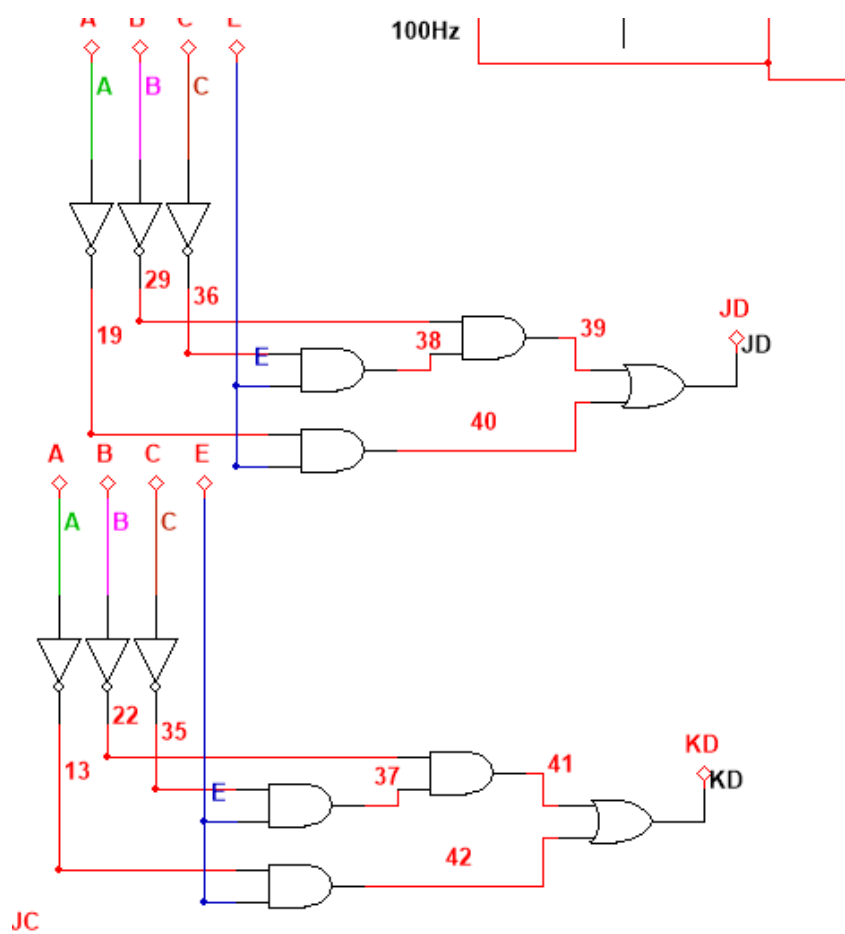


**Funcion JC y KC**

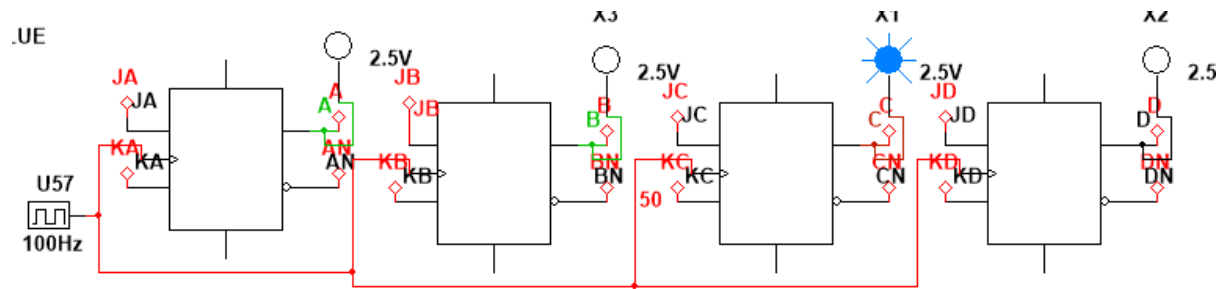




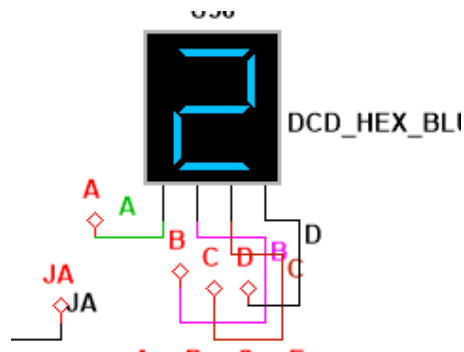
### Funcion JD y KD



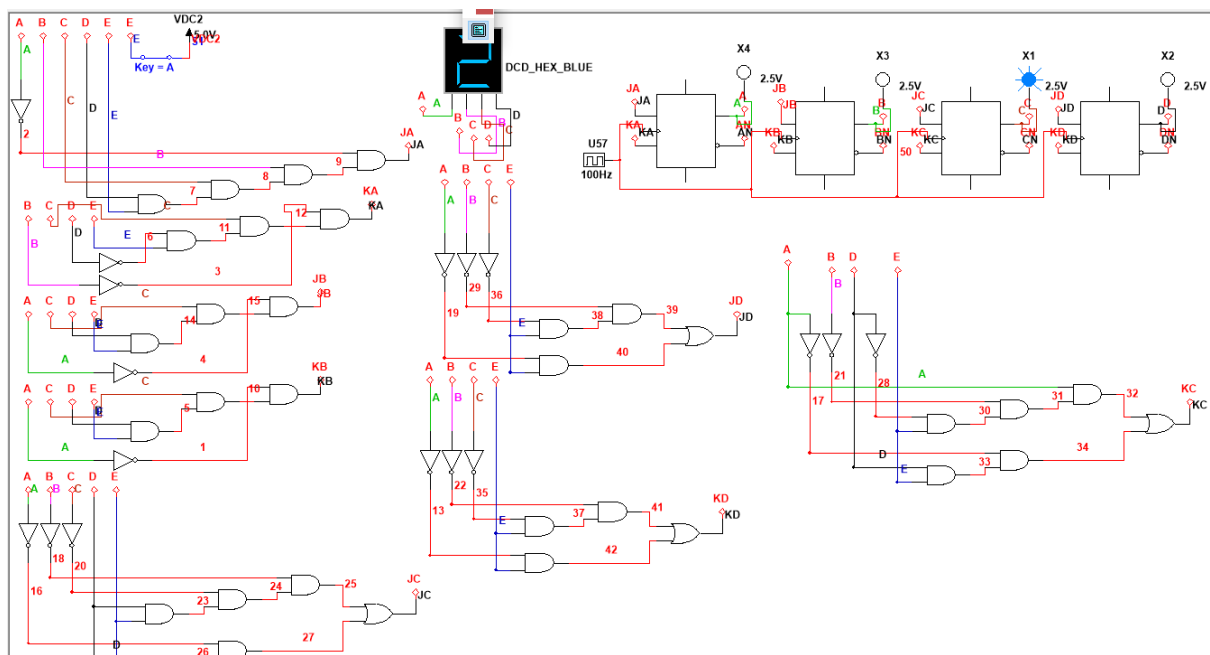
### Flip flop



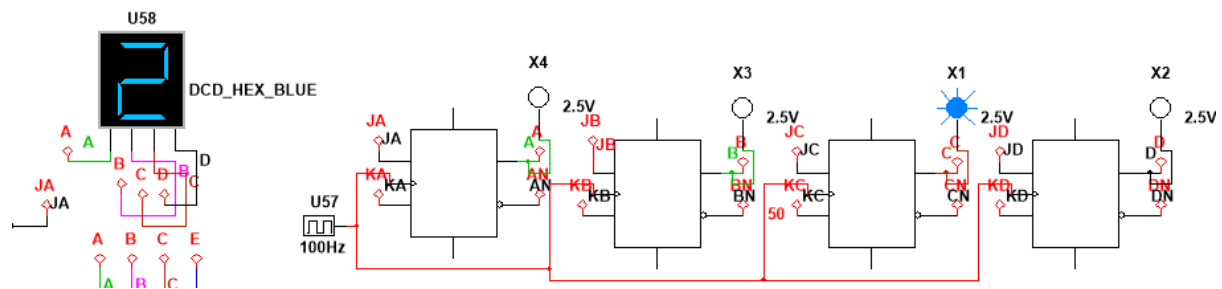
## Display



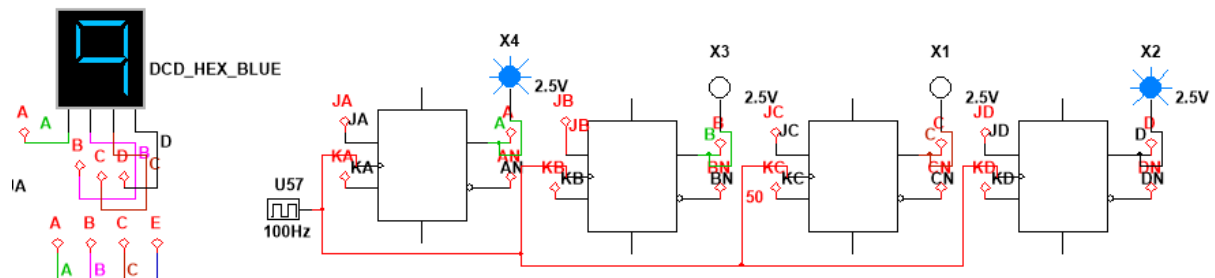
## Completo:



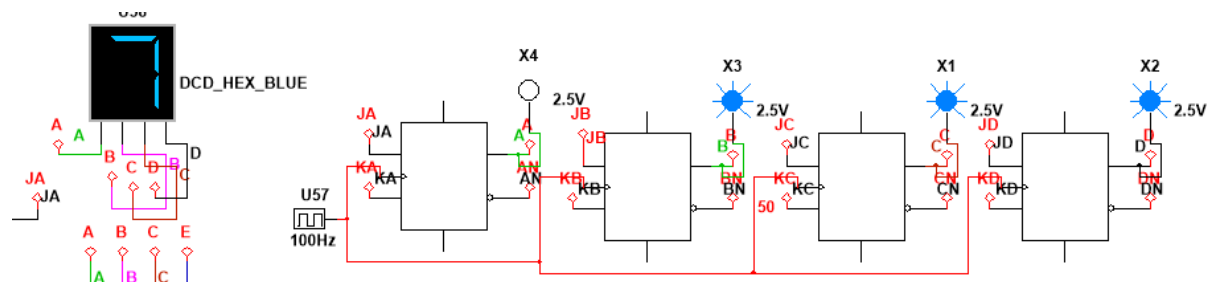
0010



1001



0111



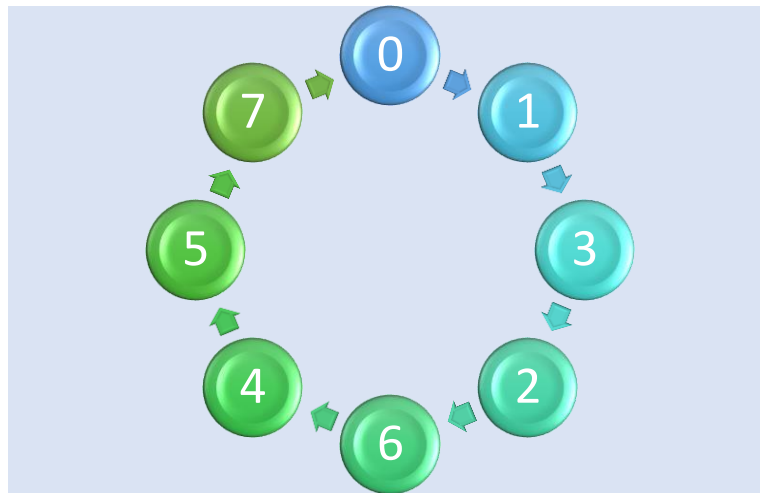
## PROBLEMA 2

Un contador con la siguiente secuencia binaria: 0,1,3,2,6,4,5,7 y que se repita. Use Flip-Flops RS.

Incluya:

- Tabla de Verdad y de Excitación.
- Diagramas de Estados.
- Diagramas Lógicos.
- Simulación (LiveWire, Multisim)





**Tabla completa:**

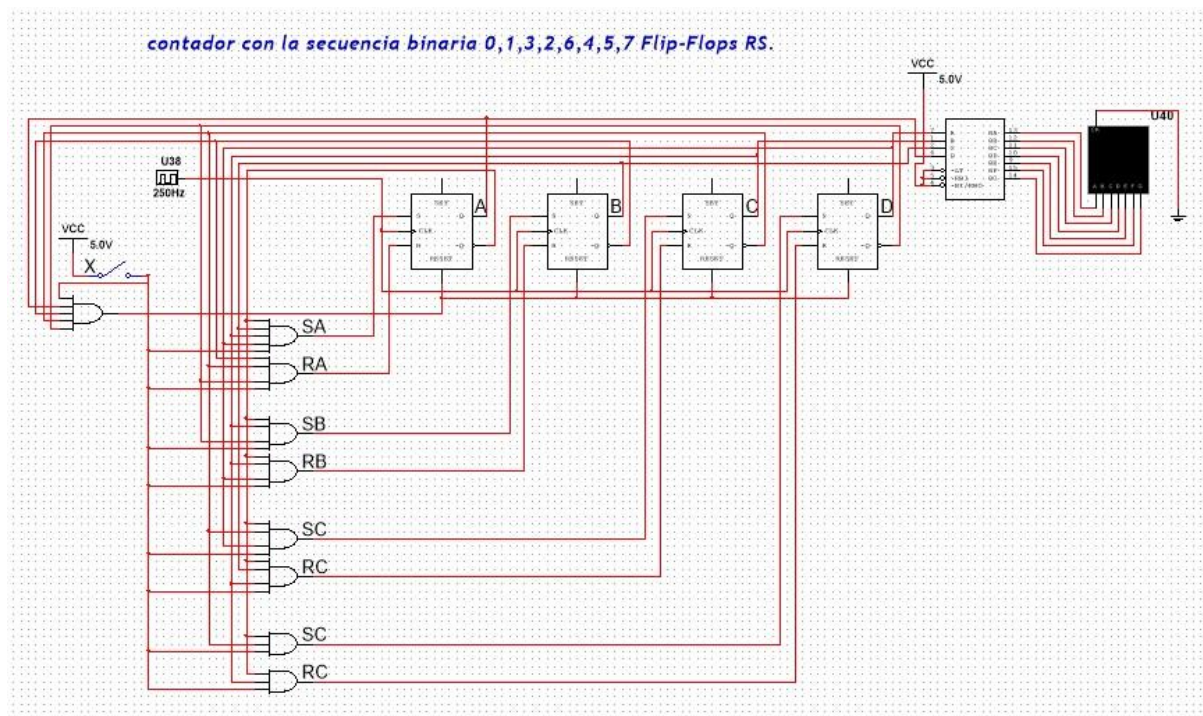
	ESTADO PRESENTE				X	ESTADO FUTURO					SALIDAS							
	A	B	C	D		A	B	C	D		SA	RA	SB	RB	SC	RC	SD	RD
0	0	0	0	0	0	0	0	0	0	0	0	X	0	X	0	X	0	X
	0	0	0	0	1	0	0	0	1	0	0	X	0	X	0	X	1	0
1	0	0	0	1	0	0	0	0	1	0	X	0	X	0	0	X	X	0
	0	0	0	1	1	0	0	1	1	0	X	0	X	1	0	0	X	0
2	0	0	1	0	0	0	0	1	0	0	X	0	0	X	0	0	0	X
	0	0	1	0	1	0	1	1	0	0	X	1	0	X	0	0	0	X
3	0	0	1	1	0	0	0	1	1	0	X	0	X	X	0	0	X	0
	0	0	1	1	1	0	0	1	0	0	X	0	X	X	0	0	0	1
4	0	1	0	0	0	0	1	0	0	0	X	X	X	0	0	X	0	X
	0	1	0	0	1	0	1	0	1	0	X	X	X	0	0	X	1	0
5	0	1	0	1	0	0	0	1	0	1	0	X	X	0	0	X	X	0
	0	1	0	1	1	0	1	1	1	0	X	X	X	0	1	0	X	0
6	0	1	1	0	0	0	1	1	0	0	0	X	X	0	X	0	0	X
	0	1	1	0	1	0	1	0	0	0	0	X	X	0	0	1	0	X
7	0	1	1	1	0	0	1	1	1	0	0	X	X	0	X	0	X	0
	0	1	1	1	1	1	1	0	0	0	1	0	0	1	0	1	0	1
8	1	0	0	0	0	1	0	0	0	0	X	0	0	X	0	X	0	X
	1	0	0	0	1	0	0	0	0	0	0	1	0	X	0	X	0	X

**Tabla separada para que se vea bien**

	ESTADO PRESENTE				X	ESTADO FUTURO				
	A	B	C	D		A	B	C	D	
0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	1	0	0	0	1	
1	0	0	0	1	0	0	0	0	1	
	0	0	0	1	1	0	0	1	1	
2	0	0	1	0	0	0	0	1	0	
	0	0	1	0	1	0	1	1	0	
3	0	0	1	1	0	0	0	1	1	
	0	0	1	1	1	0	0	1	0	
4	0	1	0	0	0	0	1	0	0	
	0	1	0	0	1	0	1	0	1	
5	0	1	0	1	0	0	1	0	1	
	0	1	0	1	1	0	1	1	1	
6	0	1	1	0	0	0	1	1	0	
	0	1	1	0	1	0	1	0	0	
7	0	1	1	1	0	0	1	1	1	
	0	1	1	1	1	1	0	0	0	
8	1	0	0	0	0	1	0	0	0	
	1	0	0	0	1	0	0	0	0	

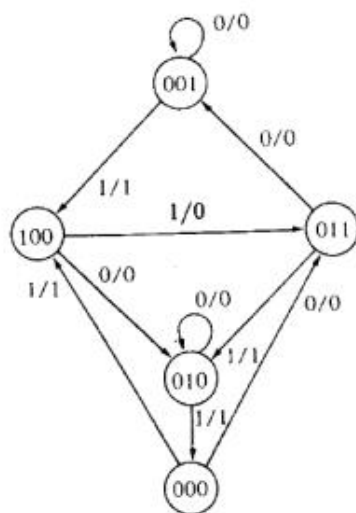
	SALIDAS							
	SA	RA	SB	RB	SC	RC	SD	RD
	0	X	0	X	0	X	0	X
	0	X	0	X	0	X	1	0
	0	X	0	X	0	X	X	0
	0	X	0	X	1	0	X	0
	0	X	0	X	X	0	0	X
	0	X	1	0	X	0	0	X
	0	X	0	X	X	0	X	0
	0	X	0	X	X	0	0	1
	0	X	X	0	0	X	0	X
	0	X	X	0	0	X	1	0
	0	X	X	0	0	X	X	0
	0	X	X	0	1	0	X	0
	0	X	X	0	X	0	0	X
	0	X	X	0	0	1	0	X
	0	X	X	0	X	0	X	0
	1	0	0	1	0	1	0	1
	X	0	0	X	0	X	0	X
	0	1	0	X	0	X	0	X

X					X'					X					X'				
SA					SA					RA					RA				
AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10
OO					OO					OO	X	X	X	X	OO	X	X	X	X
O1			1		O1					O1	X	X		X	O1	X	X	X	X
11					11					11					11				
10					10	X				10	1				10				
JA = A'BCDX										KA = B'C'D'X									
X					X'					X					X'				
SB					SB					RB					RB				
AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10
OO				1	OO					OO	X	X	X		OO	X	X	X	X
O1	X	X		X	O1	X	X	X	X	O1			1		O1				
11					11					11					11				
10					10					10	X				10	X			
JB = A'C'D'X										KB = A'CDX									
X					X'					X					X'				
SC					SC					RC					RC				
AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10
OO		1	X	X	OO			X	X	OO	X				OO	X	X		
O1		1			O1			X	X	O1	X		1	1	O1	X	X		
11					11					11					11				
10					10					10	X				10	X			
JC = A'C'DX										KC = A'BCX									
X					X'					X					X'				
SD					SD					RD					RD				
AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10	AB\CD	OO	O1	11	10
OO	1	X			OO		X	X		OO			1	X	OO	X			X
O1	1	X			O1		X	X		O1			1	X	O1	X			X
11					11					11					11				
10					10					10	X				10	X			
JD = A'C'X										KD = A'C'X									



### PROBLEMA 3

Un circuito secuencial tiene una entrada y una salida. El diagrama de estado se muestra abajo. Diseñe un circuito secuencial con FF tipo D.



- Tabla de Verdad y de Excitación.
- Diagramas de Estados.
- Diagramas Lógicos.
- Simulación (LiveWire, Multisim)

	ESTADO PRESENTE			X	ESTADO FUTURO				SALIDAS		
	A	B	C		A	B	C		DA	DB	DC
0	0	0	0	0	0	1	1		0	1	1
	0	0	0	1	1	0	0		1	0	0
1	0	0	1	0	0	0	1		0	0	1
	0	0	1	1	1	0	0		1	0	0
2	0	1	0	0	0	1	0		0	1	0
	0	1	0	1	0	0	0		0	0	0
3	0	1	1	0	0	0	1		0	0	1
	0	1	1	1	0	1	0		0	1	0
4	1	0	0	0	0	1	0		0	1	0
	1	0	0	1	0	1	1	0	1	1	

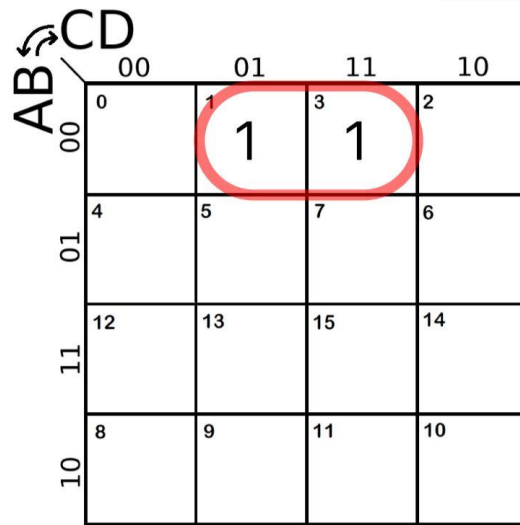
Tabla separada para que se entienda

	ESTADO PRESENTE			X	ESTADO FUTURO			
	A	B	C		A	B	C	
0	0	0	0	0	0	1	1	
	0	0	0	1	1	0	0	
1	0	0	1	0	0	0	1	
	0	0	1	1	1	0	0	
2	0	1	0	0	0	1	0	
	0	1	0	1	0	0	0	
3	0	1	1	0	0	0	1	
	0	1	1	1	0	1	0	
4	1	0	0	0	0	1	0	
	1	0	0	1	0	1	1	

SALIDAS		
DA	DB	DC
0	1	1
1	0	0
0	0	1
1	0	0
0	1	0
0	0	0
0	0	1
0	1	0
0	1	0
0	1	1

## Kmaps y funciones:

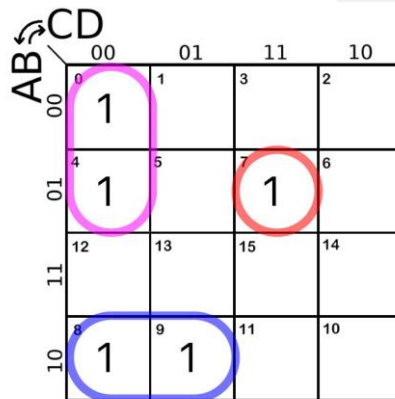
DA



Select Answer: #1/1 ▼

$$S = \bar{A}\bar{B}D$$

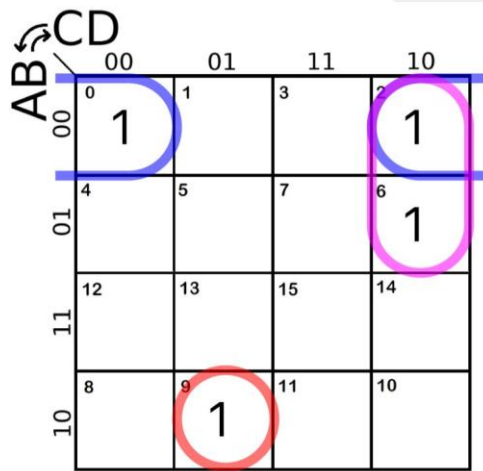
DB



Select Answer: #1/1 ▼

$$S = \bar{A}BCD + A\bar{B}\bar{C} + \bar{A}\bar{C}\bar{D}$$

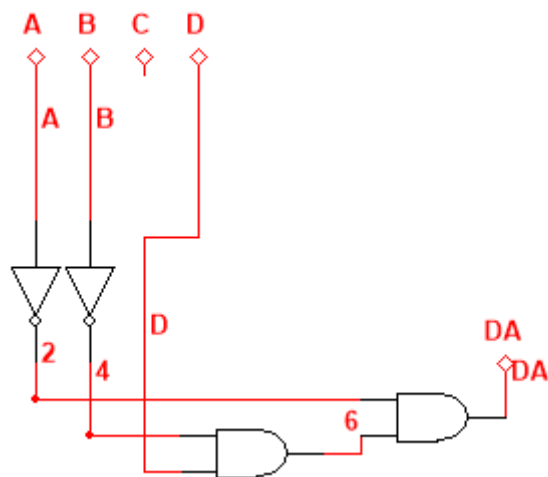
DC



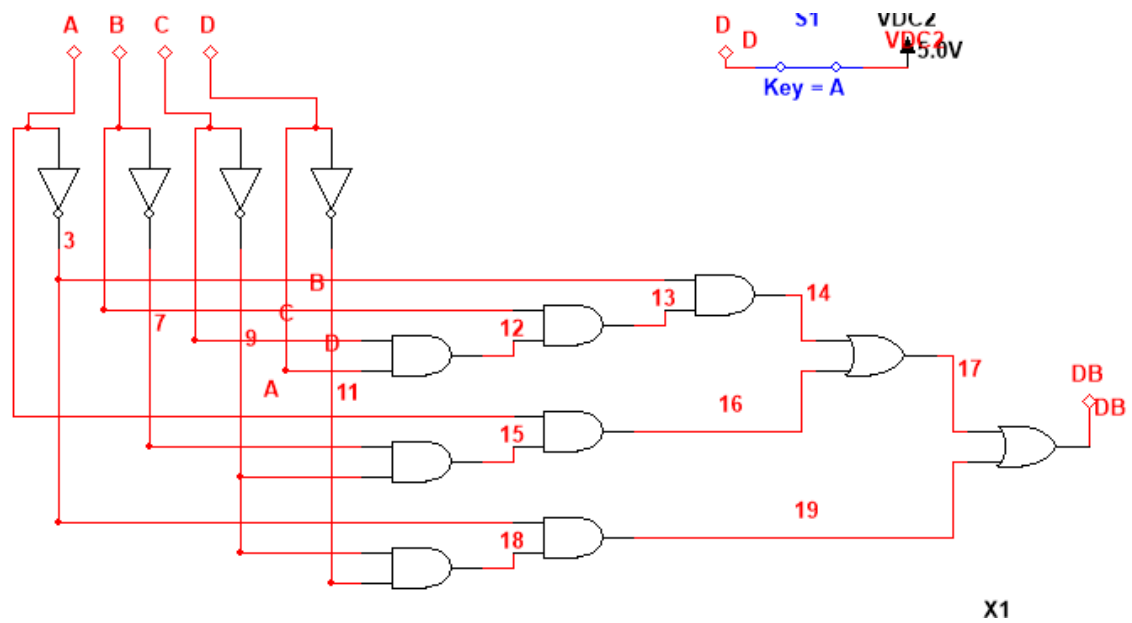
Select Answer: #1/1 ▼

$$S = \overline{A}\overline{B}\overline{C}D + \overline{A}\overline{B}D + \overline{A}C\overline{D}$$

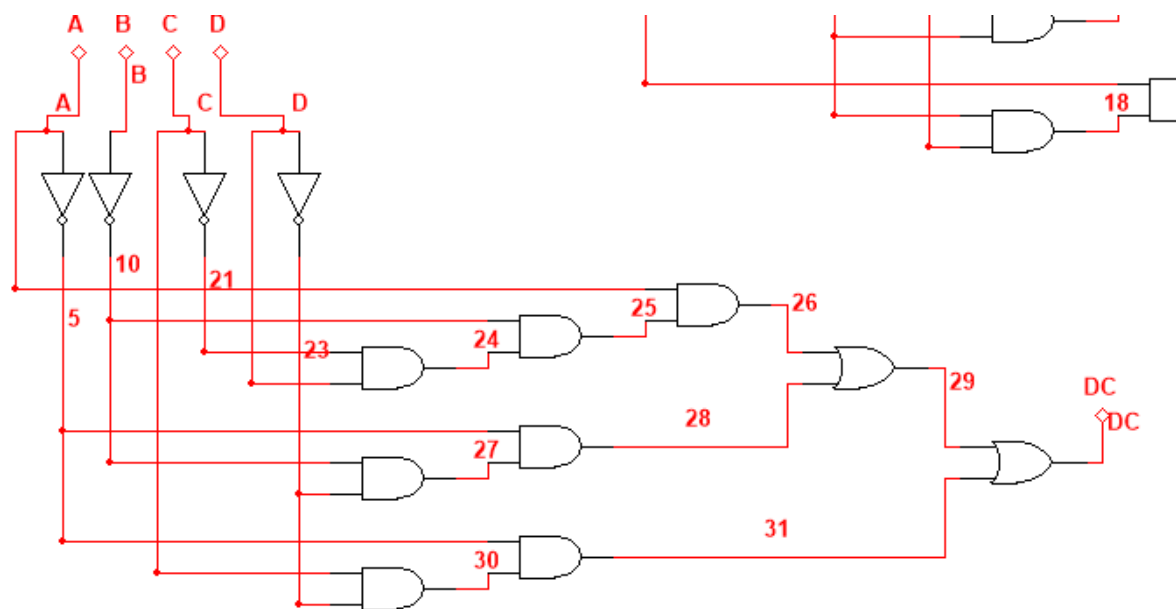
### Funcion DA



### Funcion DB

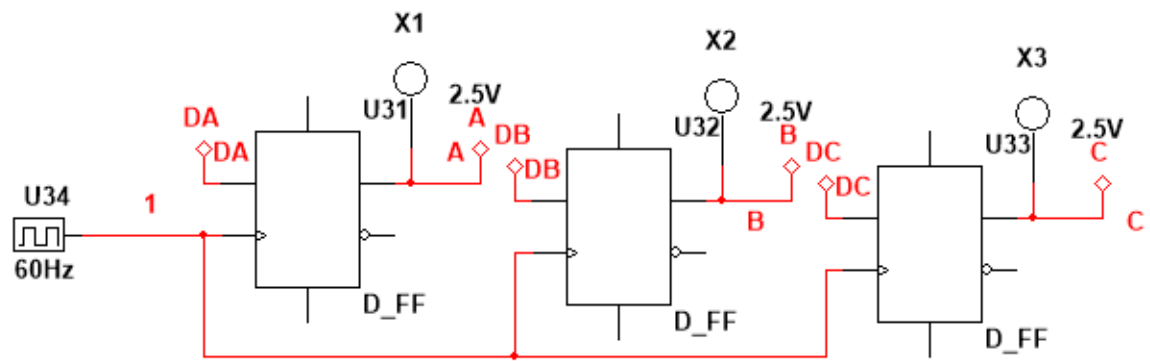


**Funcion DC**

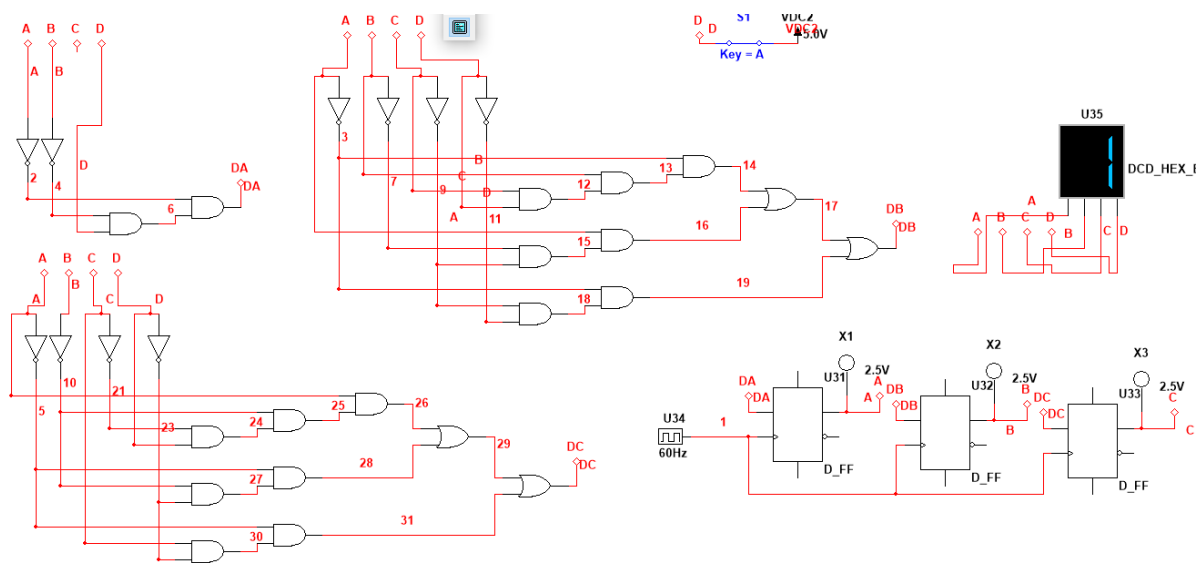


**Flip Flop**





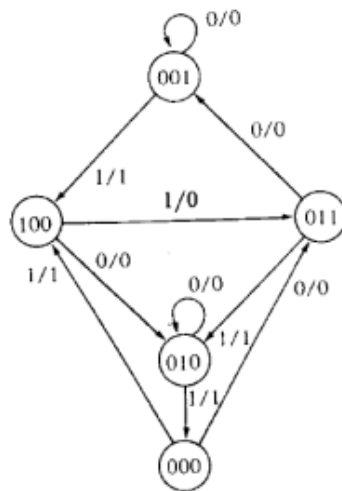
Completo:



# SISTEMAS DIGITALES LOGICA SECUENCIAL PRACTICA # 1

1-) Un circuito secuencial tiene una entrada y una salida. El diagrama de estado se muestra abajo.  
Diseñe un circuito secuencial con:

- (a) FF T
- (b) FF RS



## FF tipo T

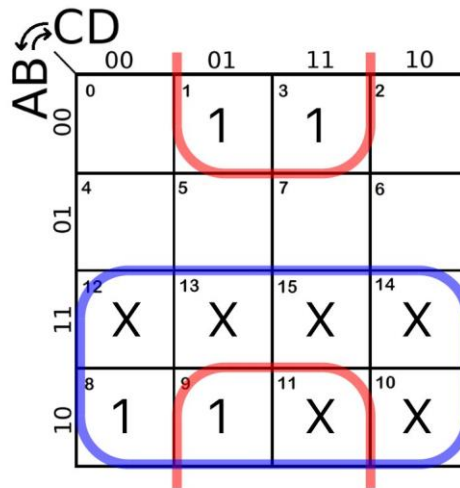
A	B	C	D		A	B	C		T1	T2	T3
0	0	0	0		0	1	1		0	1	1
0	0	0	1		1	0	0		1	0	0
0	0	1	0		0	0	1		0	0	0
0	0	1	1		1	0	0		1	0	1
0	1	0	0		0	1	0		0	0	0
0	1	0	1		0	0	0		0	1	0
0	1	1	0		0	0	1		0	1	0
0	1	1	1		0	1	0		0	0	1
1	0	0	0		0	1	0		1	1	0
1	0	0	1		0	1	1		1	1	1

Por partes para entenderlo

Presente					Futuro		
A	B	C	D		A	B	C
0	0	0	0		0	1	1
0	0	0	1		1	0	0
0	0	1	0		0	0	1
0	0	1	1		1	0	0
0	1	0	0		0	1	0
0	1	0	1		0	0	0
0	1	1	0		0	0	1
0	1	1	1		0	1	0
1	0	0	0		0	1	0
1	0	0	1		0	1	1

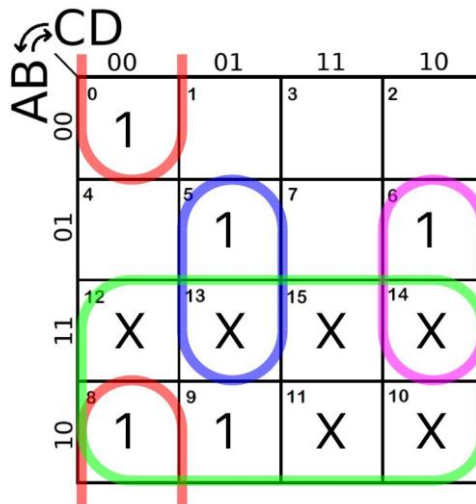
Salidas			
	T1	T2	T3
	0	1	1
	1	0	0
	0	0	0
	1	0	1
	0	0	0
	0	1	0
	0	1	0
	0	0	1
	1	1	0
	1	1	1

KMaps funciones



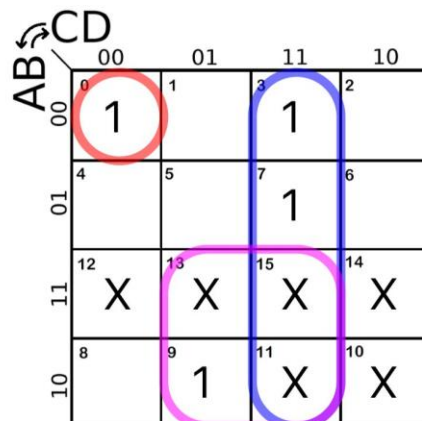
Select Answer: #1/1 ▼

$$S = \bar{B}D + A$$



Select Answer: #1/1 ▼

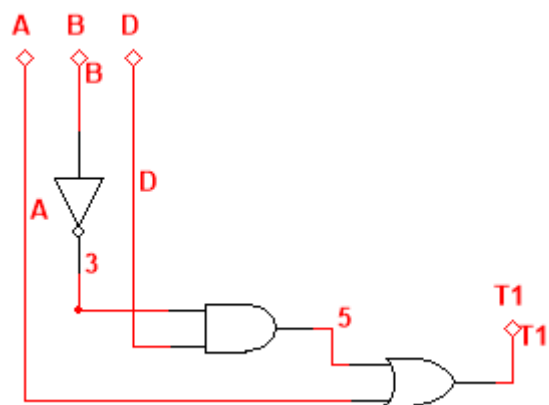
$$S = \bar{B}\bar{C}\bar{D} + \bar{B}\bar{C}D + \bar{B}C\bar{D} + A$$



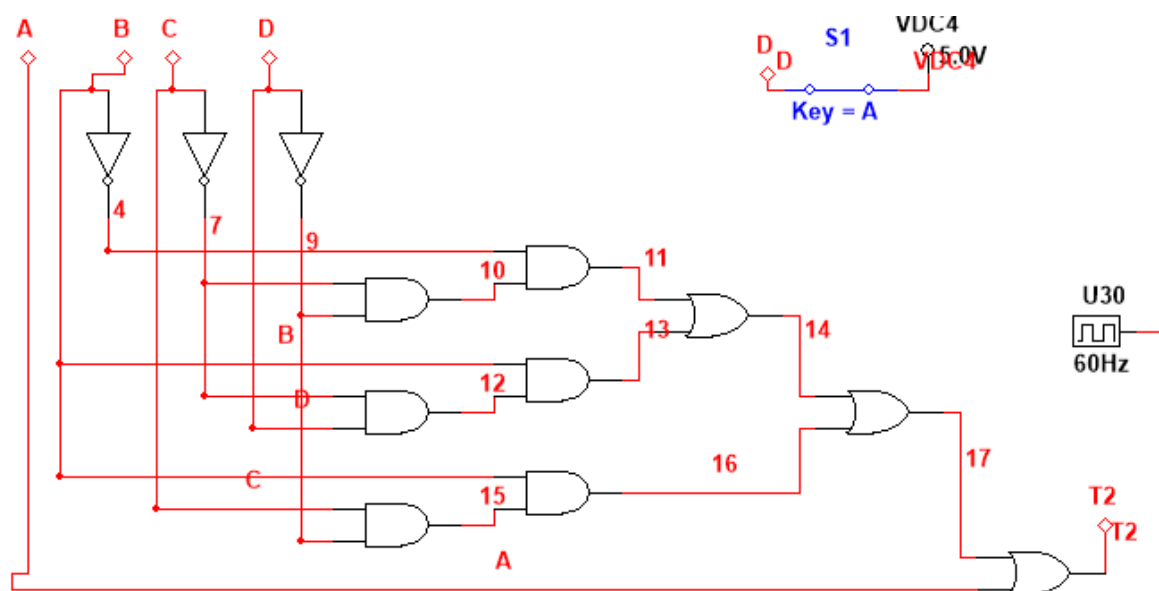
Select Answer: #1/1 ▼

$$S = \bar{A}\bar{B}\bar{C}\bar{D} + CD + AD$$

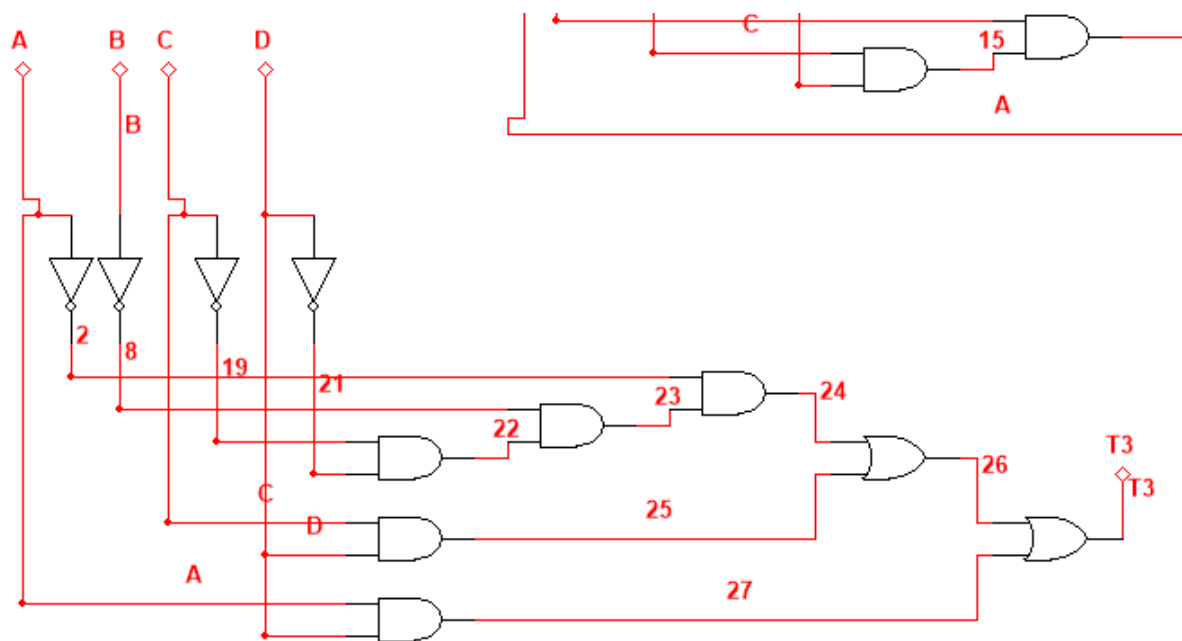
## Funcion T1



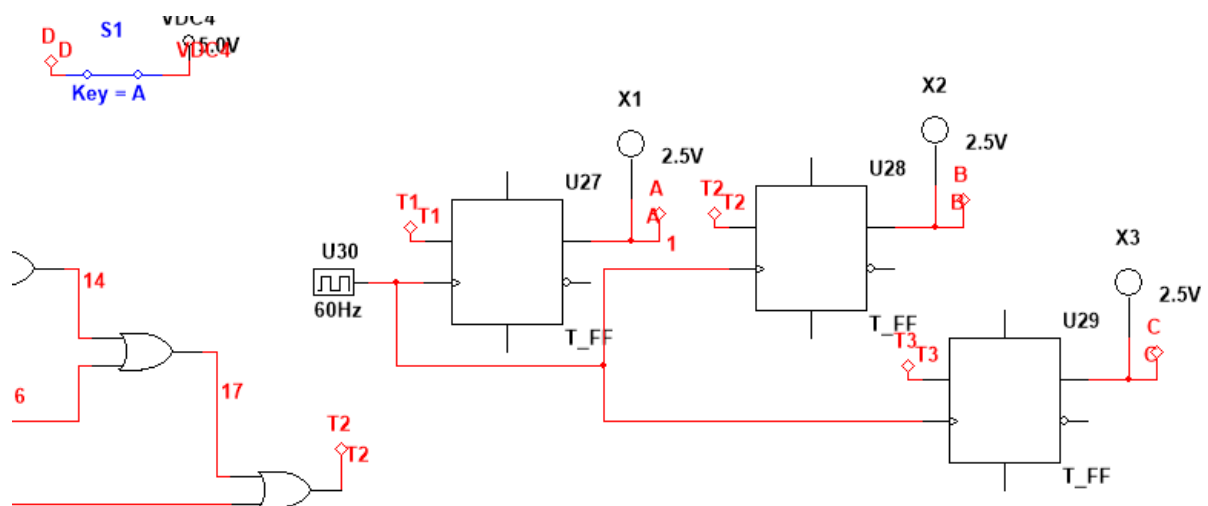
## Funcion T2



## Funcion T3



## Flip flop



Completo:



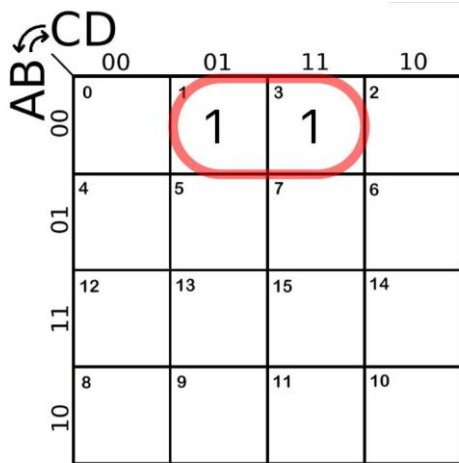
	ESTADO PRESENTE			X	ESTADO FUTURO		
	A	B	C		A	B	C
0	0	0	0	0	0	1	1
	0	0	0	1	1	0	0
1	0	0	1	0	0	0	1
	0	0	1	1	1	0	0
2	0	1	0	0	0	1	0
	0	1	0	1	0	0	0
3	0	1	1	0	0	0	1
	0	1	1	1	0	1	0
4	1	0	0	0	0	1	0
	1	0	0	1	0	1	1

SALIDAS							
SA	RA	SB	RB	SC	RC		
0	X	1	0	1	0		0
1	0	0	X	0	X		1
0	X	0	X	X	0		2
1	0	0	X	0	1		3
0	X	X	0	0	X		4
0	X	0	1	0	X		5
0	X	0	1	X	0		6
0	X	X	0	0	1		7
0	1	1	0	0	X		8
0	1	1	0	1	0	9	

**Kmaps y funciones**

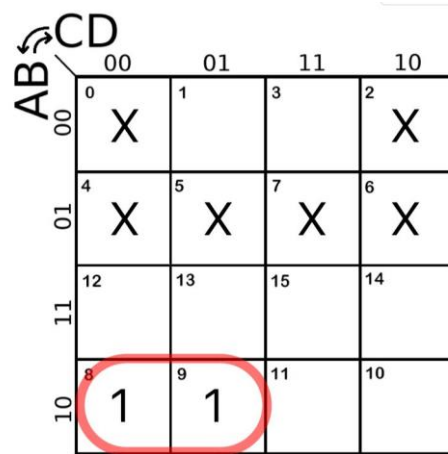
**SA Y RA**





Select Answer: #1/1 ▼

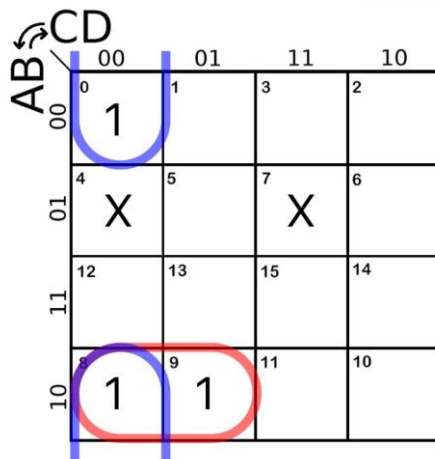
$$S = \bar{A}\bar{B}D$$



Select Answer: #1/1 ▼

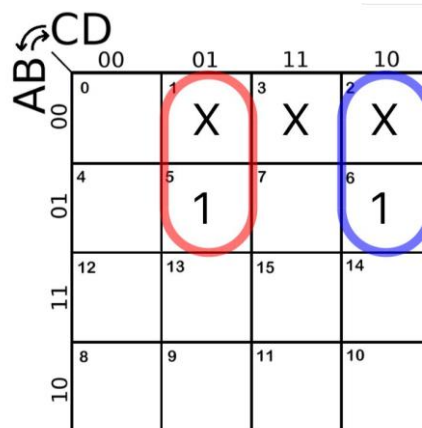
$$S = A\bar{B}\bar{C}$$

### SB Y RB



Select Answer: #1/2 ▼

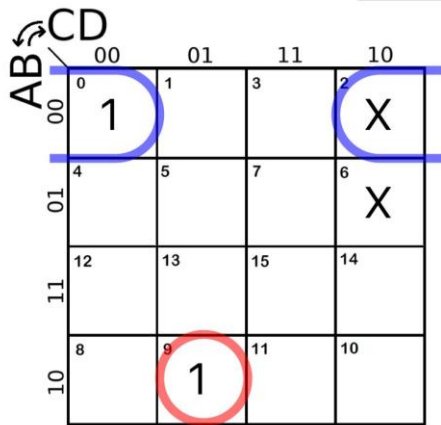
$$S = A\bar{B}\bar{C} + \bar{B}C\bar{D}$$



Select Answer: #1/1 ▼

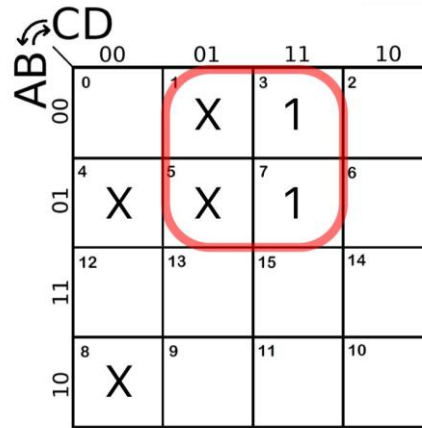
$$S = \bar{A}\bar{C}D + \bar{A}C\bar{D}$$

### SC Y RC



Select Answer: #1/1 ▼

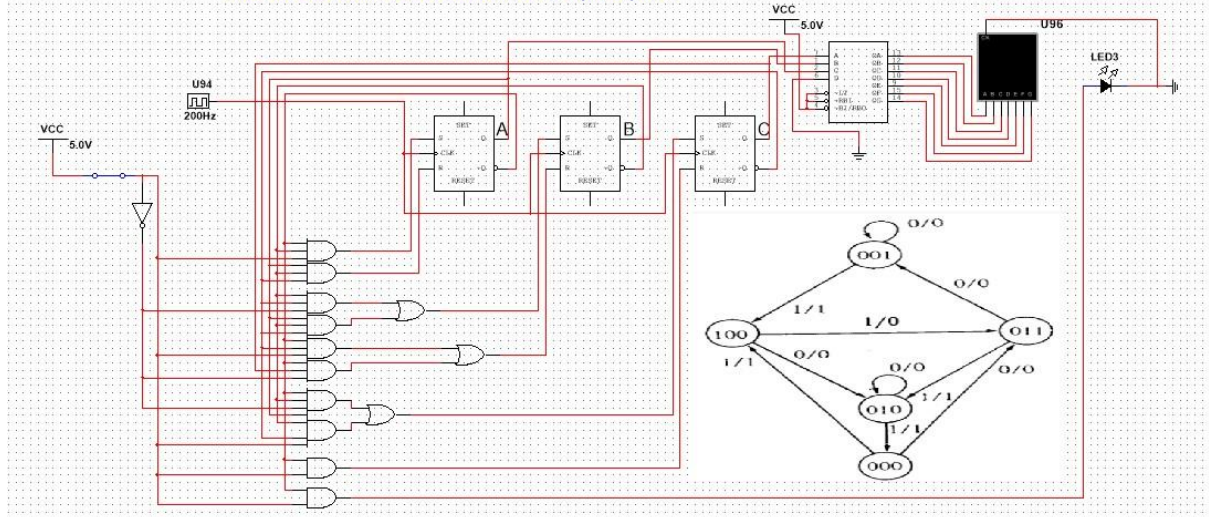
$$S = \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}D\bar{C}$$



Select Answer: #1/1 ▼

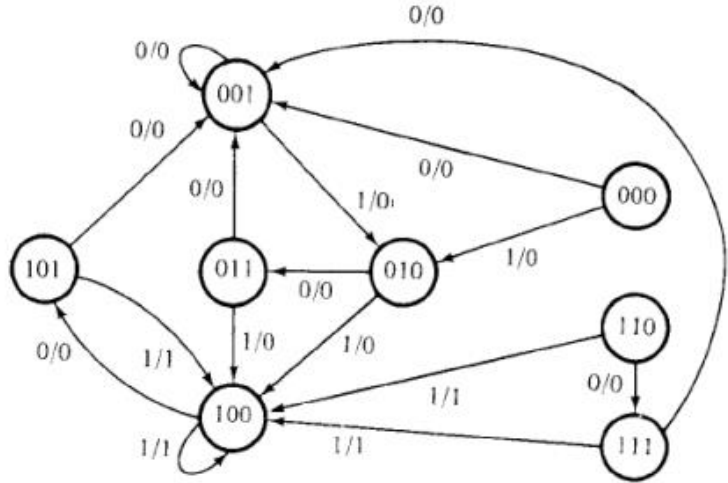
$$S = \bar{A}D$$

Diseñe un circuito secuencial con Flip Flop RS



2-) Un circuito secuencial tiene una entrada y una salida. El diagrama de estado se muestra abajo.  
 Diseñe un circuito secuencial con:

(a) FF RS



	ESTADO PRESENTE			X	ESTADO FUTURO			SALIDA					
	A	B	C		A	B	C	SA	RA	SB	RB	SC	RC
0	0	0	0	0	0	0	1	0	X	0	X	1	0
	0	0	0	1	0	1	0	0	X	1	0	0	X
1	0	0	1	0	0	0	1	0	X	0	X	X	0
	0	0	1	1	0	1	0	0	X	1	0	0	1
2	0	1	0	0	0	1	1	0	X	X	0	1	0
	0	1	0	1	1	1	0	0	1	0	1	0	X
3	0	1	1	0	0	0	1	0	X	0	1	X	0
	0	1	1	1	1	1	0	0	1	0	1	0	1
4	1	0	0	0	1	0	1	X	0	0	X	1	0
	1	0	0	1	1	0	0	X	0	0	X	0	X
5	1	0	1	0	0	0	1	0	1	0	X	X	0
	1	0	1	1	1	1	0	X	0	0	X	0	1
6	1	1	0	0	1	1	1	X	0	X	0	1	0
	1	1	0	1	1	0	0	X	0	0	1	0	X
7	1	1	1	0	0	0	1	0	1	0	1	X	0
	1	1	1	1	1	0	0	X	0	0	1	0	1

Por separado para que se entienda:

	ESTADO PRESENTE			X	ESTADO FUTURO		
	A	B	C		A	B	C
0	0	0	0	0	0	0	1
	0	0	0	1	0	1	0
1	0	0	1	0	0	0	1
	0	0	1	1	0	1	0
2	0	1	0	0	0	1	1
	0	1	0	1	1	0	0
3	0	1	1	0	0	0	1
	0	1	1	1	1	0	0
4	1	0	0	0	1	0	1
	1	0	0	1	1	0	0
5	1	0	1	0	0	0	1
	1	0	1	1	1	0	0
6	1	1	0	0	1	1	1
	1	1	0	1	1	0	0
7	1	1	1	0	0	0	1
	1	1	1	1	1	0	0

SALIDA						
SA	RA	SB	RB	SC	RC	
0	X	0	X	1	0	0
0	X	1	0	0	X	1
0	X	0	X	X	0	2
0	X	1	0	0	1	3
0	X	X	0	1	0	4
1	0	0	1	0	X	5
0	X	0	1	X	0	6
1	0	0	1	0	1	7
X	0	0	X	1	0	8
X	0	0	X	0	X	9
0	1	0	X	X	0	10
X	0	0	X	0	1	11
X	0	X	0	1	0	12
X	0	0	1	0	X	13
0	1	0	1	X	0	14
X	0	0	1	0	1	15

SA					RA				
AB\CX	OO	O1	11	IO	AB\CX	OO	O1	11	IO
OO					OO	X	X	X	X
O1		1	1		O1	X			X
11	X	X	X		11				1
IO	X	X	X		IO				1
SA = BX					RA = CX'				

SB					RB				
AB\CX	OO	O1	11	IO	AB\CX	OO	O1	11	IO
OO		1	1		OO	X			X
O1	X				O1		1	1	1
11	X				11		1	1	1
IO					IO	X	X	X	X
SB = A'B'X					RB = BX + BC				

SC					RC				
AB\CX	OO	O1	11	IO	AB\CX	OO	O1	11	IO
OO	1			X	OO		X	1	
O1	1			X	O1		X	1	
11	1			X	11		X	1	
IO	1			X	IO		X	1	
SC = X'					RC = X				

