North South University
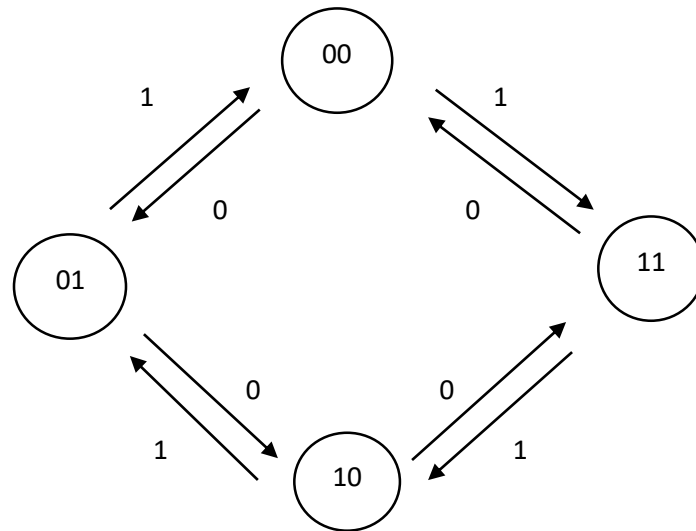Department of Electrical & Computer Engineering

Assessment 03

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Course : CSE231.1

Constructing a Sequential Circuit using JK , D and T Flip-Flops

Figure : State Diagram for a Synchronous Sequential Circuit

Number of input = 1 (X)

Number of state variable = 2 (A,B)

When input x = 0, loop will go anti-clock wise.

When input x = 1, loop will go clock wise.

Constructing a Sequential Circuit using D Flip-Flops :

Previous State		Input	Next state		Flip-Flop Input Function	
A	B	X	A	B	D_A	D_B
0	0	0	0	1	0	1
0	0	1	1	1	1	1
0	1	0	1	0	1	0
0	1	1	0	0	0	0
1	0	0	1	1	1	1
1	0	1	0	1	0	1
1	1	0	0	0	0	0
1	1	1	1	0	1	0

BX

A

	1		1
1		1	

BX

A

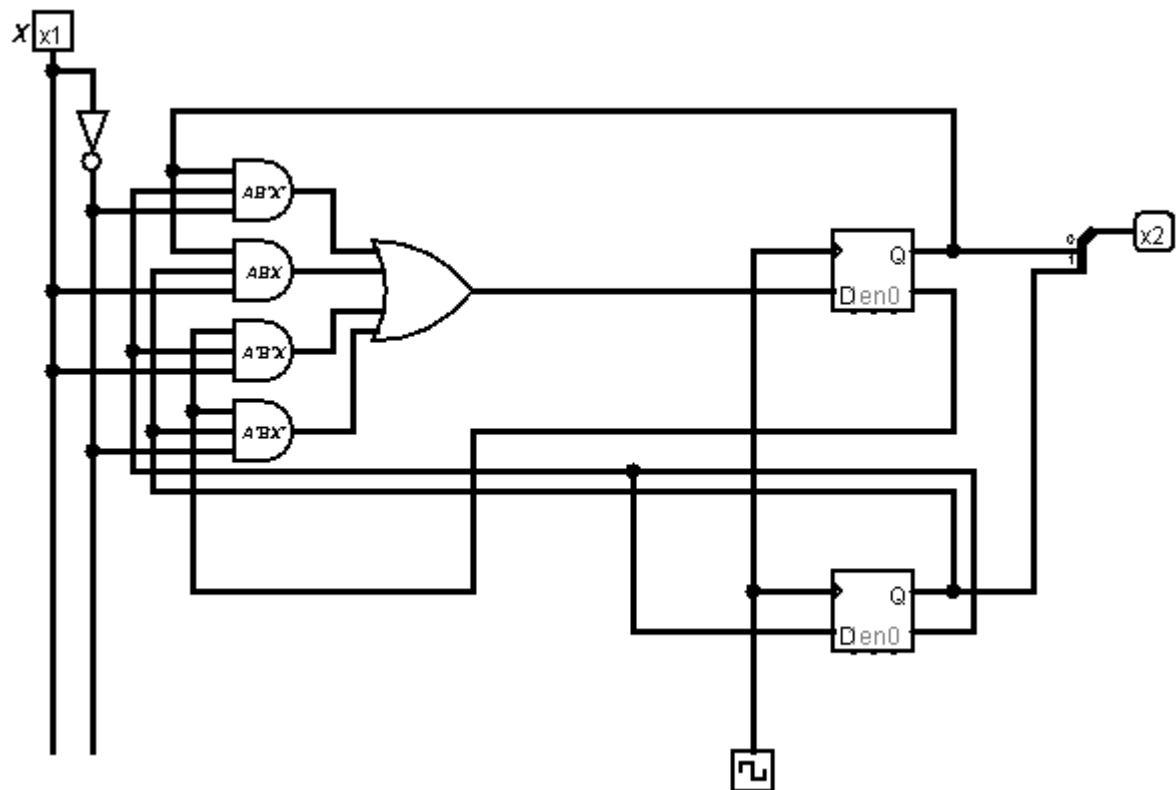| 1	1		
1	1		

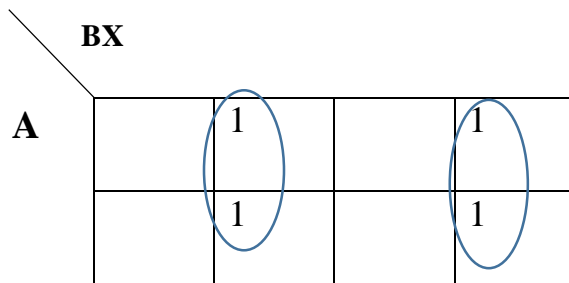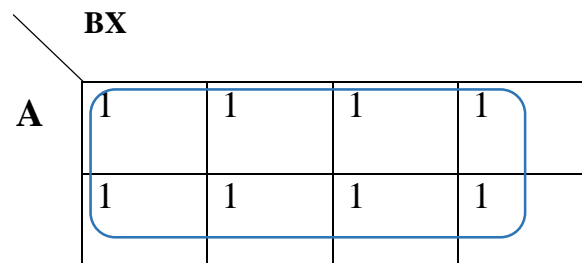$D_A = AB'X' + A'B'X + A'BX' + ABX$ $D_B = B'$

Figure- D Flip-Flop

Constructing a Sequential Circuit using T Flip-Flops :
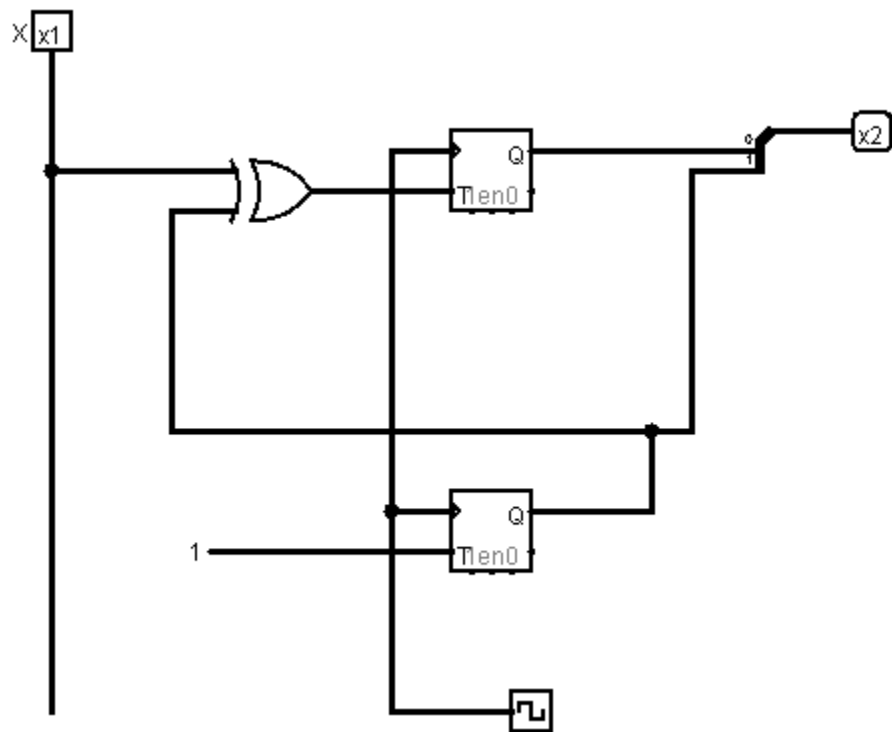
Previous State		Input	Next state		Flip-Flop Input Function	
A	B	X	A	B	T_A	T_B
0	0	0	0	1	0	1
0	0	1	1	1	1	1
0	1	0	1	0	1	1
0	1	1	0	0	0	1
1	0	0	1	1	0	1
1	0	1	0	1	1	1
1	1	0	0	0	1	1
1	1	1	1	0	0	1

BX

A

	1		1
	1		1

BX

A

1	1	1	1
1	1	1	1

$T_A = B'X + BX'$

$T_{B} = 1$

Figure – T flip-flop

Constructing a Sequential Circuit using JK Flip-Flops :

Previous State		Input	Next state		Flip-Flop Input Function			
A	B	X	A	B	J_A	K_A	J_B	K_B
0	0	0	0	1	0	x	1	x
0	0	1	1	1	1	x	1	x
0	1	0	1	0	1	x	x	1
0	1	1	0	0	0	x	x	1
1	0	0	1	1	x	0	1	x
1	0	1	0	1	x	1	1	x
1	1	0	0	0	x	1	x	1
1	1	1	1	0	x	0	x	1

BX

A

	1		1
X	X	X	X

$J_A =$ B'X + BX'

BX

A

X	X	X	X
	1		1

$K_A =$ B'X + BX'

BX

A

1	1	X	X
1	1	X	X

$J_B =$ **1**

BX

A

X	X	1	1
X	X	1	1

$K_B =$ **1**

Figure- JK Flip-Flop