North South University

Department of Electrical & Computer Engineering

ASSIGNMENT

Course Name: Digital Logic Design
Course Code: CSE231
Section: 01

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

Submitted To: Taoseef Ishtiak
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Remarks:		

Sequential Diagram:

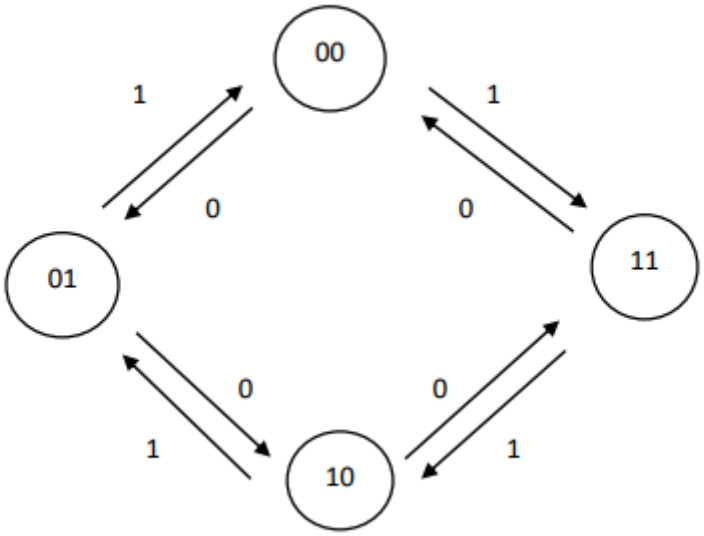

Figure: State Diagram for a Synchronous Sequential Circuit

The Number of inputs in the Diagram = 1(X)

The Number of state variable in the Diagram = 2 (A, B)

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

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

Constructing a Sequential Circuit using D Flip-Flops:

Previous State		Inputs	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

K-maps:

A\BX	00	01	11	10
0	0	1	0	1
1	1	0	1	0

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

A\BX	00	01	11	10
0	1	1	0	0
1	1	1	0	0

$D_B = B'$

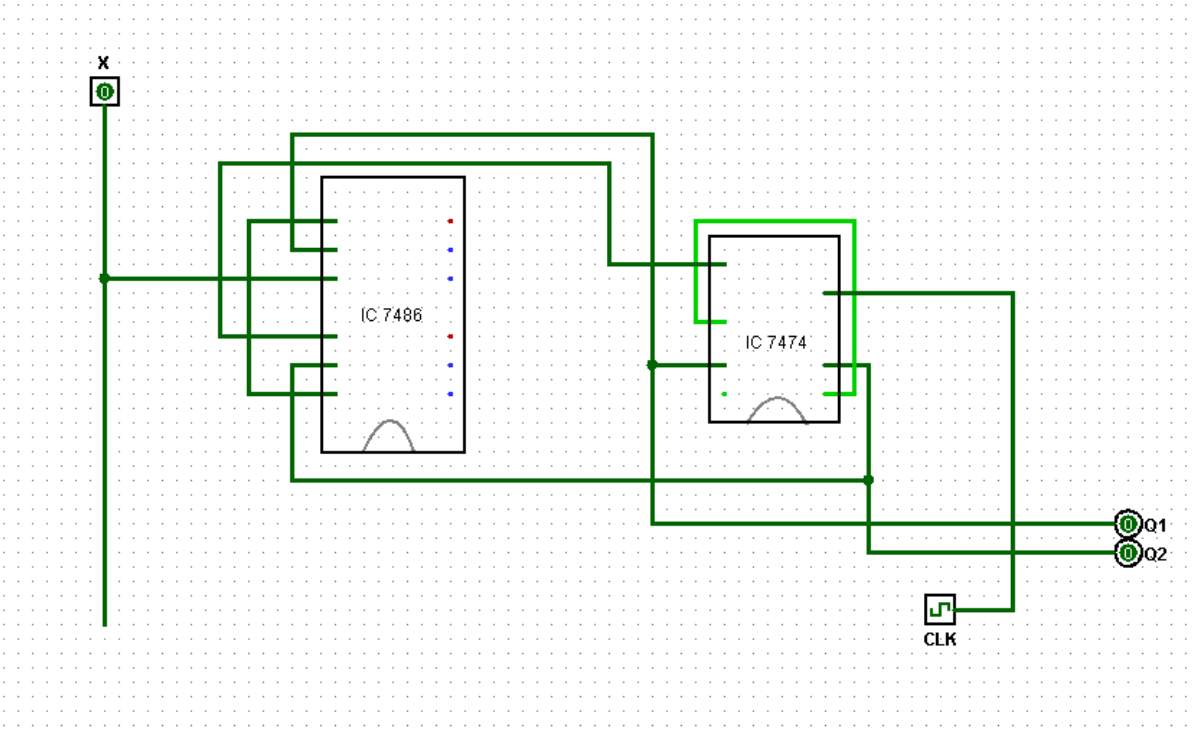

Figure: Sequential Circuit using D Flip-Flops

Constructing a Sequential Circuit using T Flip-Flops:

Previous State		Inputs	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

K-maps:

A\BX	00	01	11	10
0	0	1	0	1
1	0	1	0	1

$T_A = B'X + BX'$

A\BX	00	01	11	10
0	1	1	1	1
1	1	1	1	1

$T_B = 1$

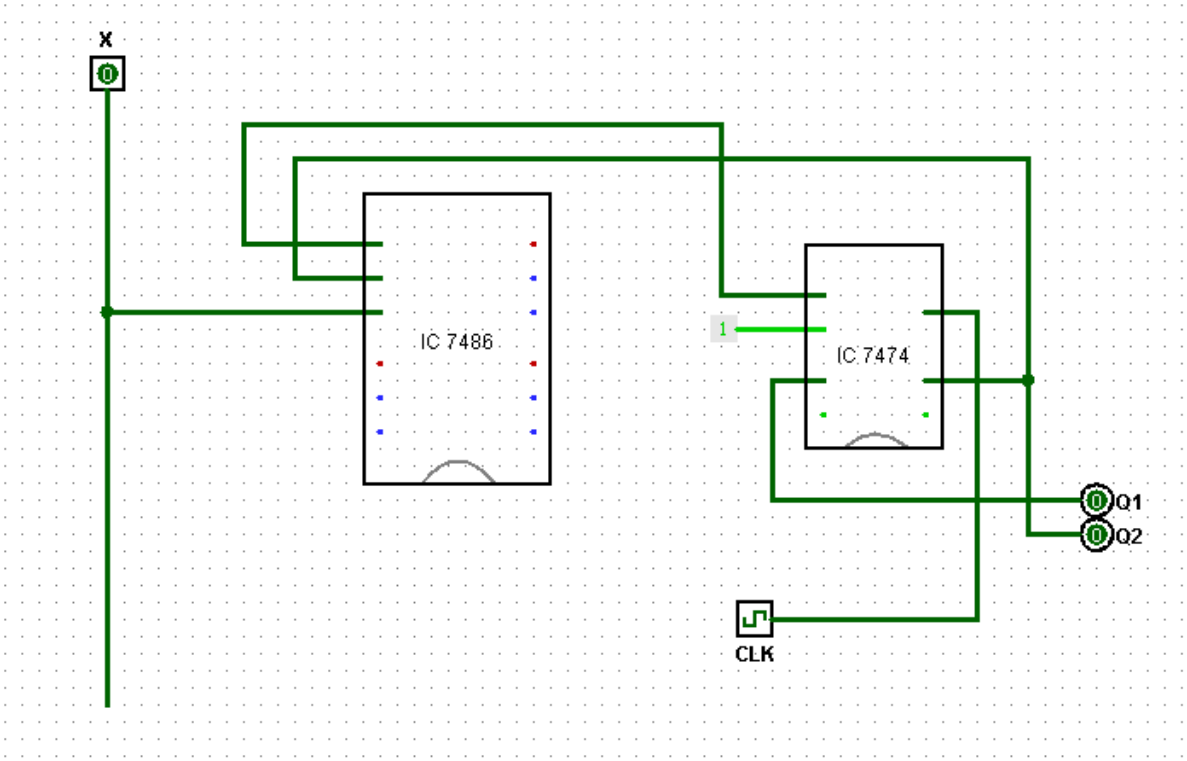

Figure: Sequential Circuit using T Flip-Flops

Constructing a Sequential Circuit using JK Flip-Flops:

Previous State		Inputs	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

K-Maps:

A\BX	**00**	**01**	**11**	**10**
0	0	1	0	1
1	X	X	X	X

$J_A = B'X + BX'$

A\BX	**00**	**01**	**11**	**10**
0	X	X	X	X
1	0	1	0	1

$K_A = B'X + BX'$

A\BX	**00**	**01**	**11**	**10**
0	**1**	**1**	**X**	**X**
1	**1**	**1**	**X**	**X**

$J_B = 1$

A\BX	00	01	11	10
0	X	X	1	1
1	X	X	1	1

$K_B = 1$

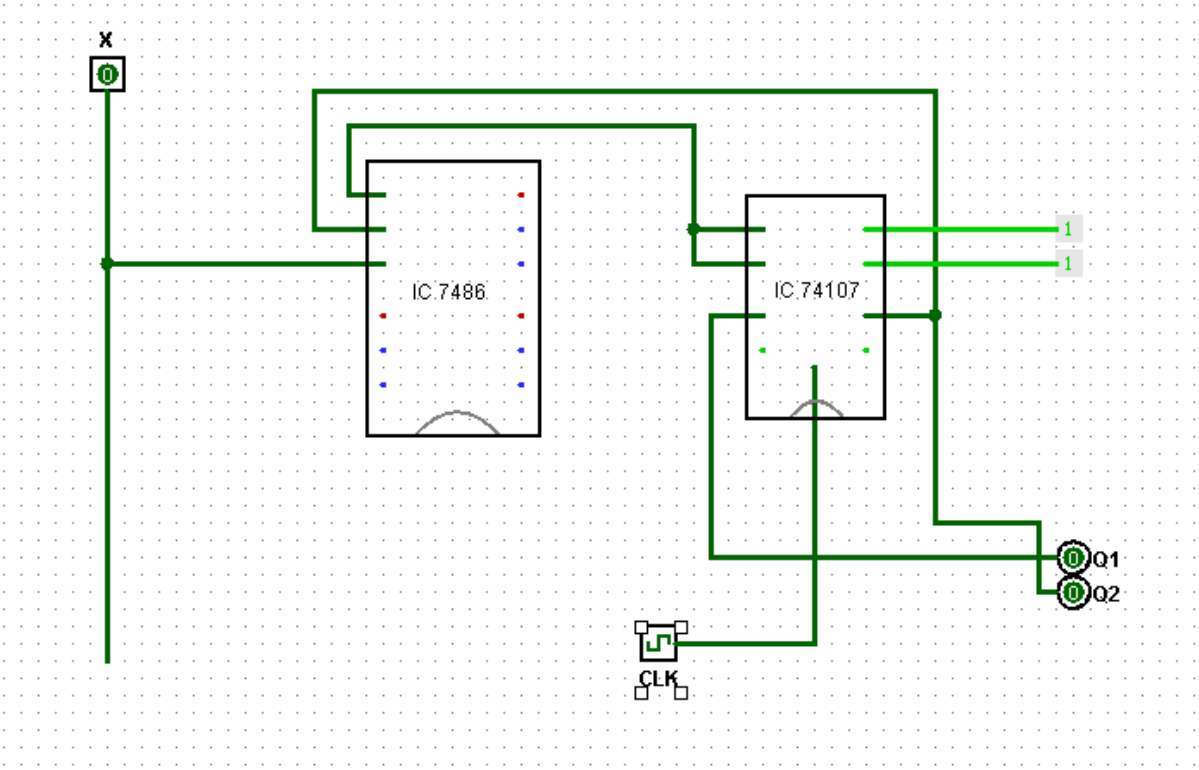

Figure: Sequential Circuit using JK Flip-Flops