Digital Electronics and Computer Organization

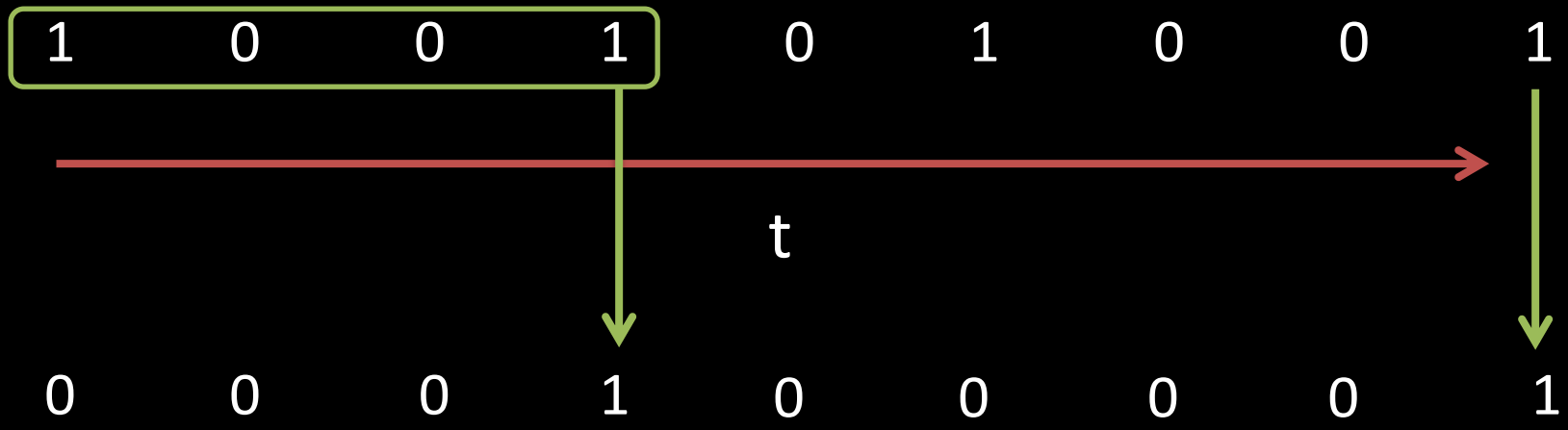
Digital Design

Lecture 19: Sequence Detector

Design of Clocked sequential Circuits

Design of sequence detector (1001)

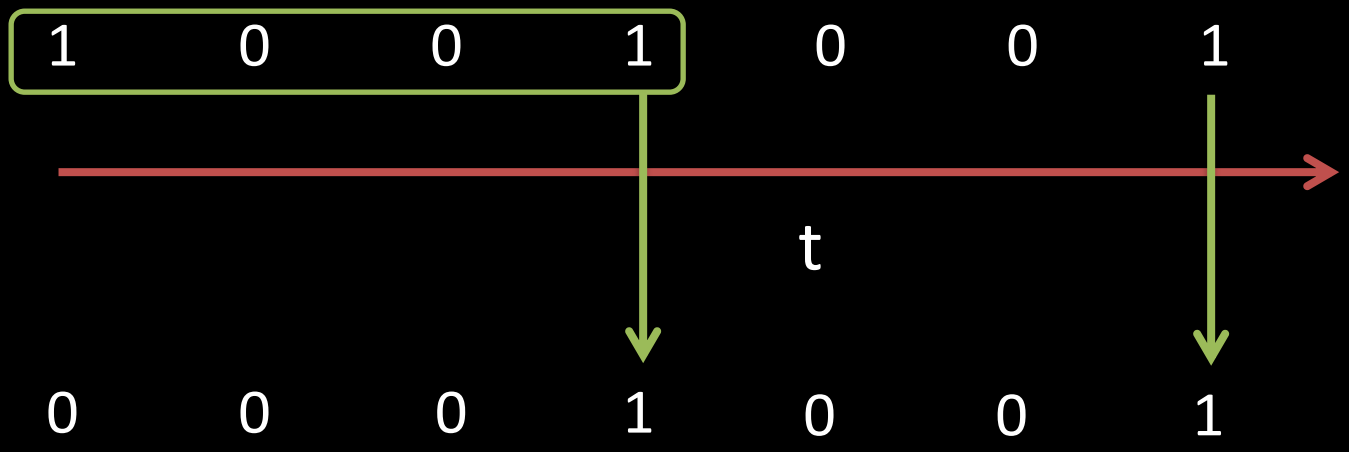
Bit stream as input



Design of Clocked sequential Circuits

Design of sequence detector (1001)

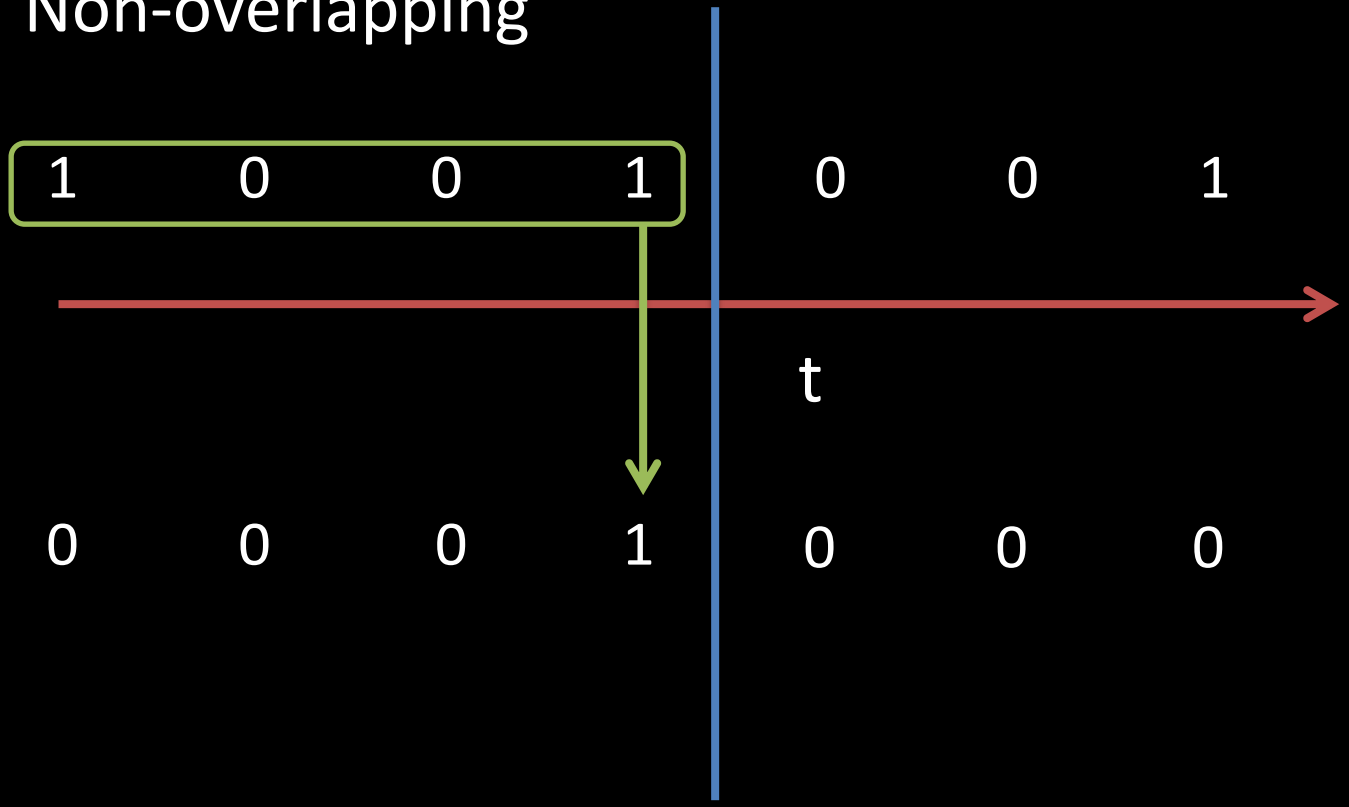
Overlapping



Design of Clocked sequential Circuits

Design of sequence detector (1001)

Non-overlapping

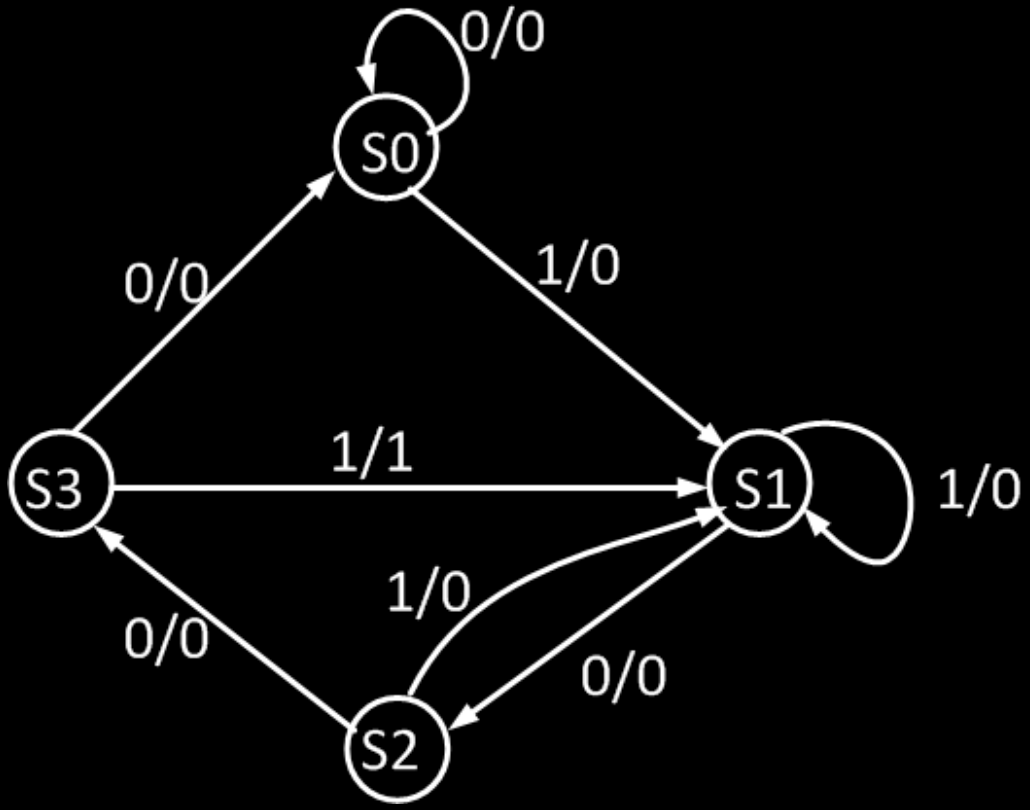


Design of Clocked sequential Circuits

Design of sequence detector overlapping (1001)

Design of Clocked sequential Circuits

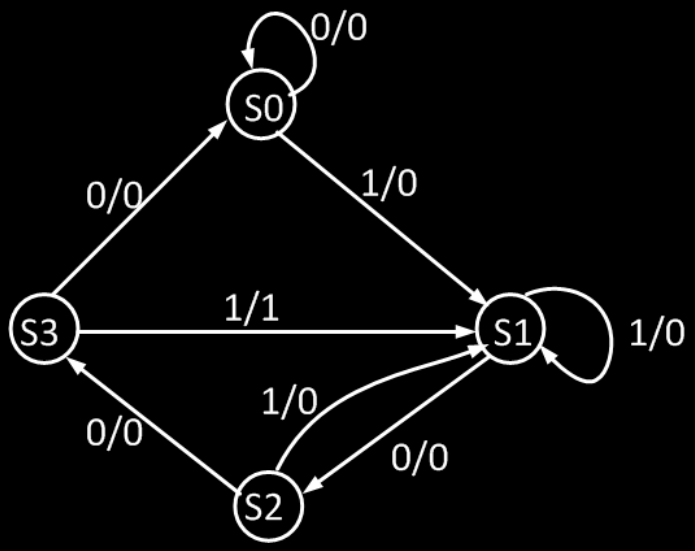
Design of sequence detector overlapping (1001)



S0 – 00
S1 – 01
S2 – 10
S3 – 11

Design of Clocked sequential Circuits

Design of sequence detector overlapping (1001)



S0 – 00
S1 – 01
S2 – 10
S3 – 11

Present State			in	Next State			Out
	Q_A	Q_B	X		$Q_{A(t+1)}$	$Q_{B(t+1)}$	Y
S0	0	0	0	S0	0	0	0
S0	0	0	1	S1	0	1	0
S1	0	1	0	S2	1	0	0
S1	0	1	1	S1	0	1	0
S2	1	0	0	S3	1	1	0
S2	1	0	1	S1	0	1	0
S3	1	1	0	S0	0	0	0
S3	1	1	1	S1	0	1	1

Design of Clocked sequential Circuits

Present State			in	Next State			Out
	Q_A	Q_B	X		$Q_{A(t+1)}$	$Q_{B(t+1)}$	Y
S0	0	0	0	S0	0	0	0
S0	0	0	1	S1	0	1	0
S1	0	1	0	S2	1	0	0
S1	0	1	1	S1	0	1	0
S2	1	0	0	S3	1	1	0
S2	1	0	1	S1	0	1	0
S3	1	1	0	S0	0	0	0
S3	1	1	1	S1	0	1	1

D_A	D_B
0	0
0	1
1	0
0	1
1	1
0	1
0	0
0	1

$D_A = Q_A'Q_BX' + Q_AQ_B'X'$

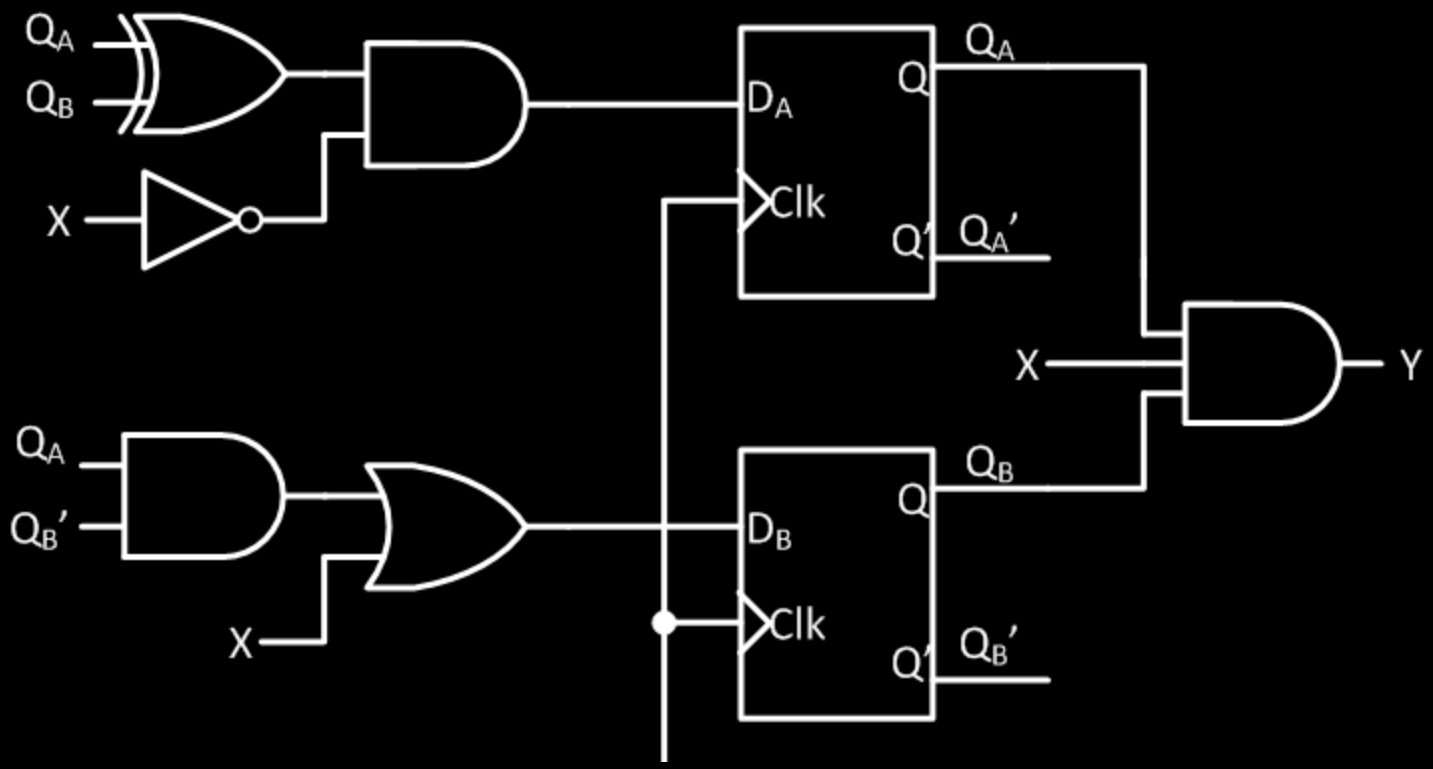
$D_B = X + Q_AQ_B'$

$Y = Q_AQ_BX$

Design of Clocked sequential Circuits

$D_A = Q_A'Q_BX' + Q_AQ_B'X' = (Q_A \oplus Q_B)\,X'$ $\qquad Y = Q_AQ_BX$

$D_B = X + Q_AQ_B'$



Design of Clocked sequential Circuits

Present State			in	Next State			Out
	Q_A	Q_B	X		$Q_{A(t+1)}$	$Q_{B(t+1)}$	Y
S0	0	0	0	S0	0	0	0
S0	0	0	1	S1	0	1	0
S1	0	1	0	S2	1	0	0
S1	0	1	1	S1	0	1	0
S2	1	0	0	S3	1	1	0
S2	1	0	1	S1	0	1	0
S3	1	1	0	S0	0	0	0
S3	1	1	1	S1	0	1	1

J_A	K_A
0	X
0	X
1	X
0	X
X	0
X	1
X	1
X	1

J_B	K_B
0	X
1	X
X	1
X	0
1	X
1	X
X	1
X	0

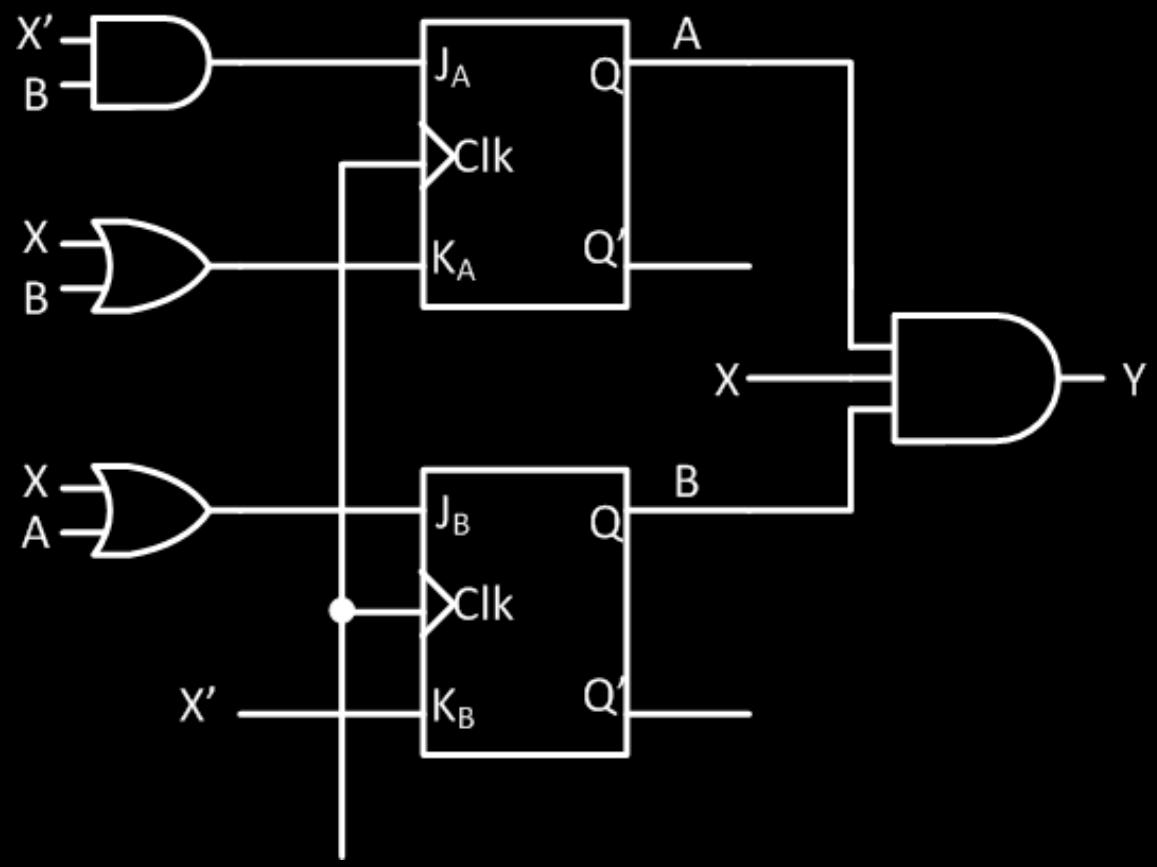
$J_A = Q_B X'$ $K_A = Q_B + X$

$J_B = Q_A + X$ $K_B = X'$

$Y = Q_A Q_B X$

Design of Clocked sequential Circuits

Design of sequence detector overlapping (1001)- JK Flip-flop



$J_A = Q_B X'$

$K_A = Q_B + X$

$J_B = Q_A + X$

$K_B = X'$

$Y = Q_A Q_B X$

Next class

State Reduction

Thank You