

Lecture 5-Sequential Circuit Analysis Examples

FNA

Flip-Flop Characteristic Tables

JK Flip-Flop

J	K	$Q(t + 1)$	
0	0	$Q(t)$	No change
0	1	0	Reset
1	0	1	Set
1	1	$Q'(t)$	Complement

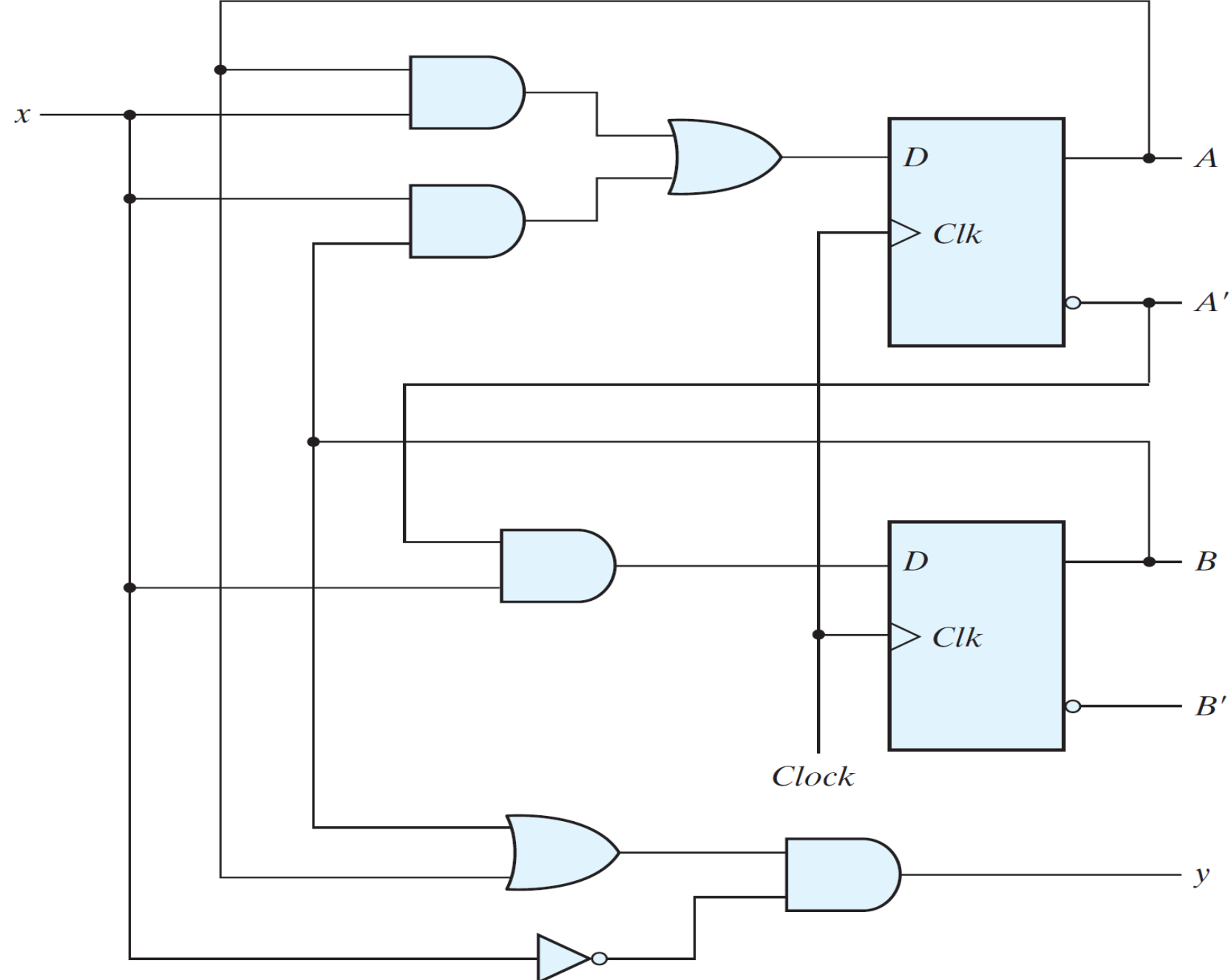
D Flip-Flop

D	$Q(t + 1)$	
0	0	Reset
1	1	Set

T Flip-Flop

T	$Q(t + 1)$	
0	$Q(t)$	No change
1	$Q'(t)$	Complement

Ex 1



$$D_A = Ax + Bx$$

$$D_B = A'x$$

$$Y = (B + A)x'$$

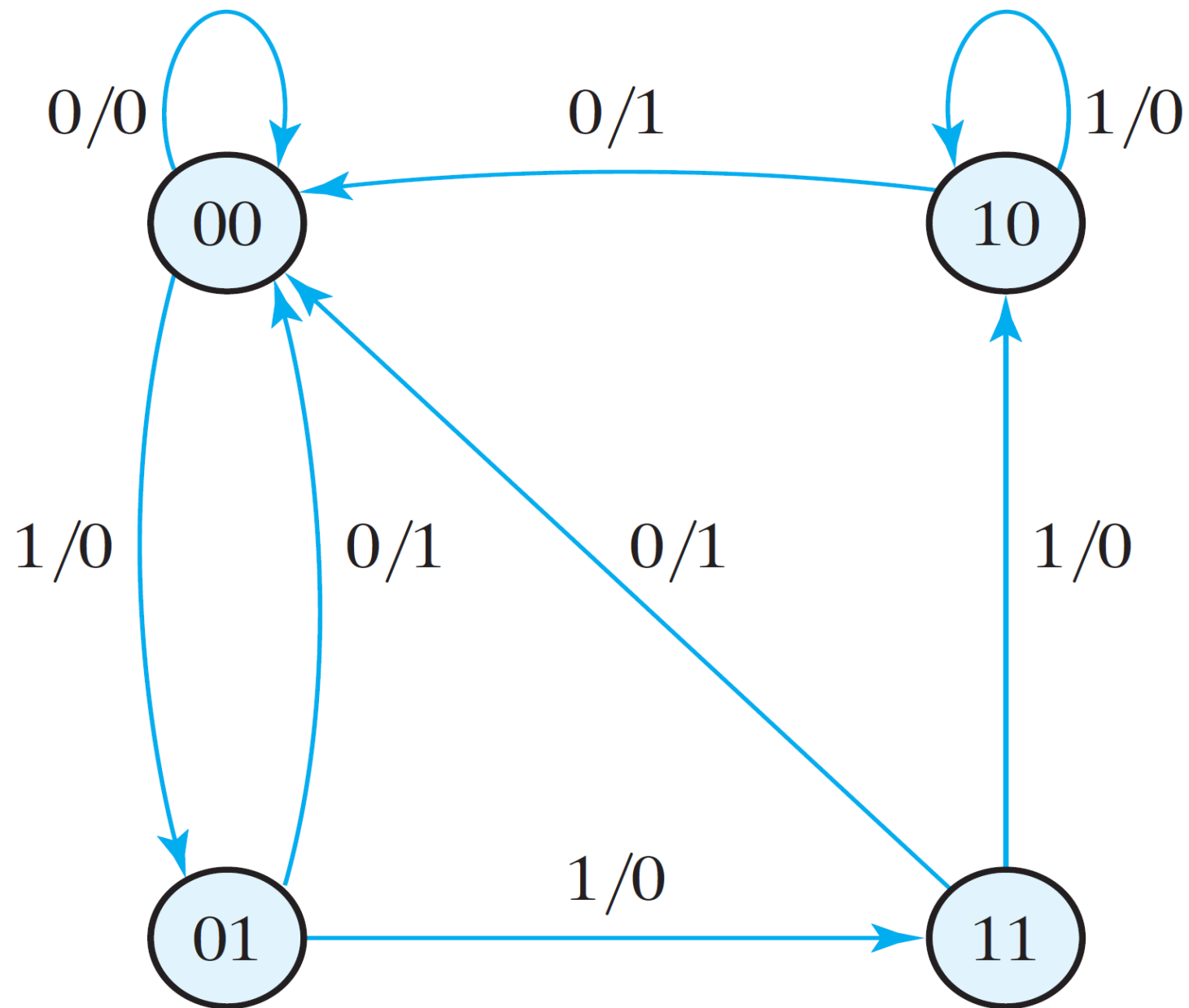
D Flip-Flop

<i>D</i>	<i>Q(t + 1)</i>
0	0 Reset
1	1 Set

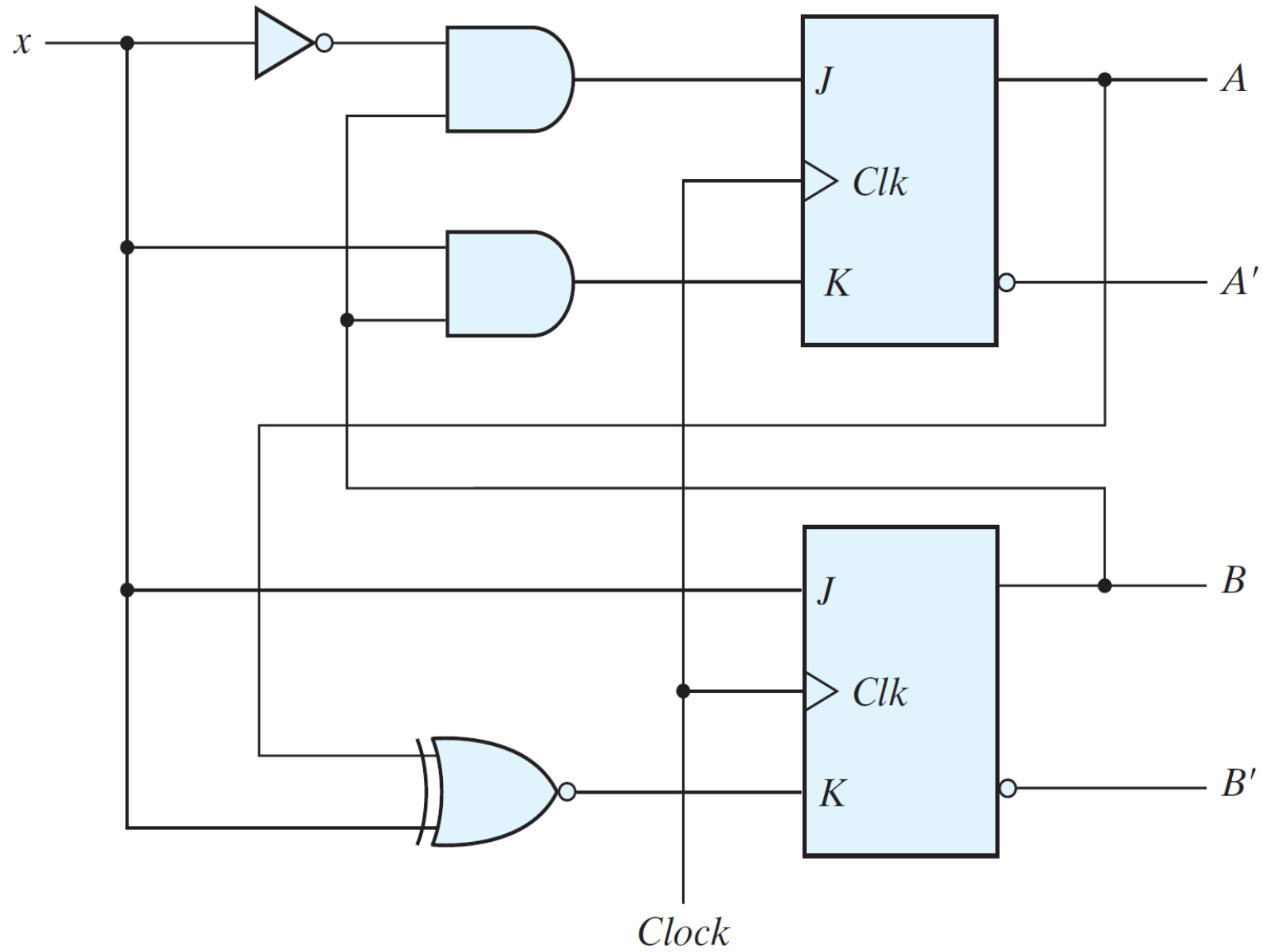
Present State		Input	Next State		Output
<i>A</i>	<i>B</i>	<i>x</i>	<i>A</i>	<i>B</i>	<i>y</i>
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	0	1
0	1	1	1	1	0
1	0	0	0	0	1
1	0	1	1	0	0
1	1	0	0	0	1
1	1	1	1	0	0

Second Form of the State Table

Present State		Next State				Output	
		$x = 0$		$x = 1$		$x = 0$	$x = 1$
		A	B	A	B	y	y
0	0	0	0	0	1	0	0
0	1	0	0	1	1	1	0
1	0	0	0	1	0	1	0
1	1	0	0	1	0	1	0



Ex 2



$$J_A = Bx'$$

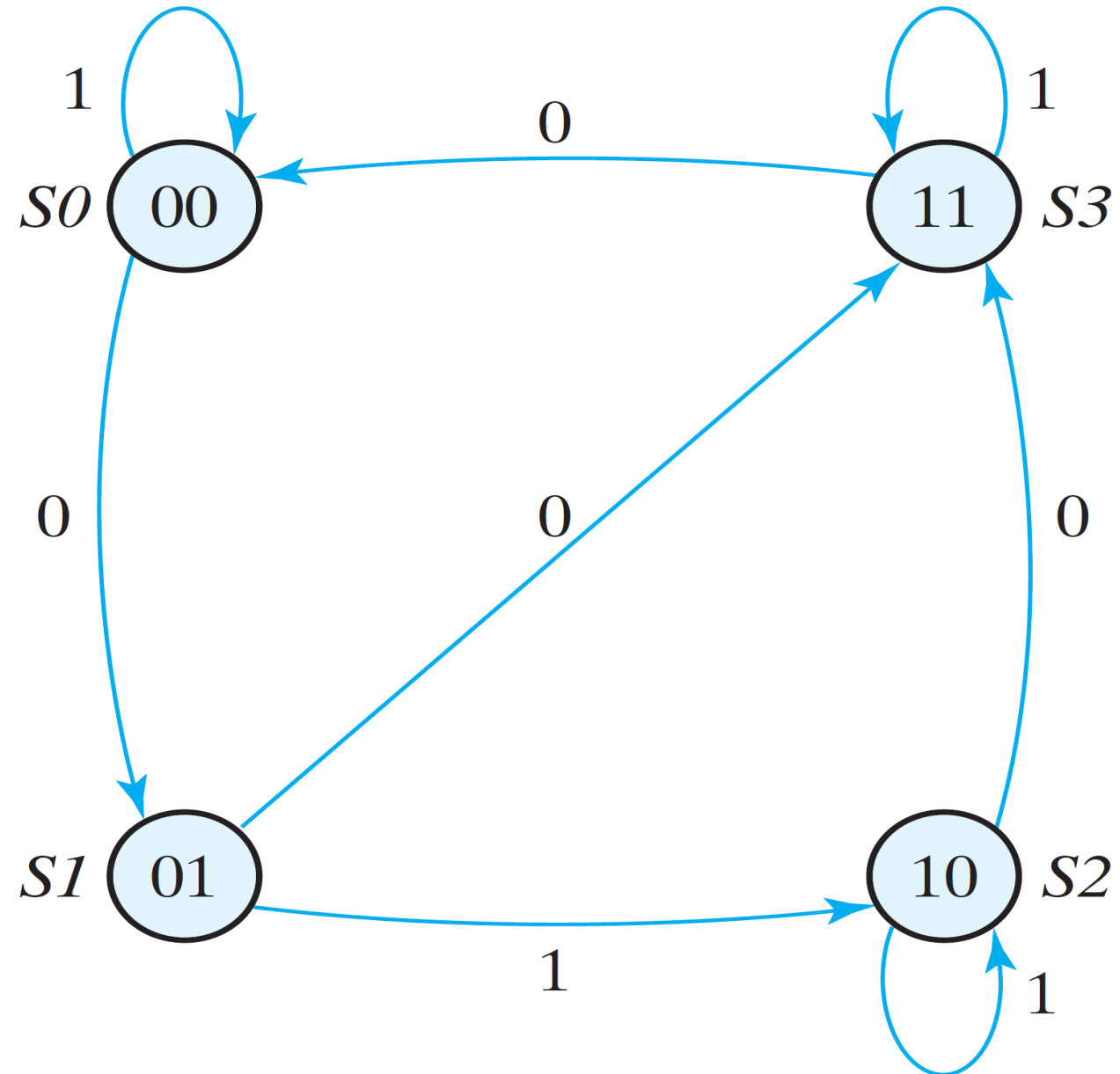
$$K_A = Bx$$

$$J_B = x$$

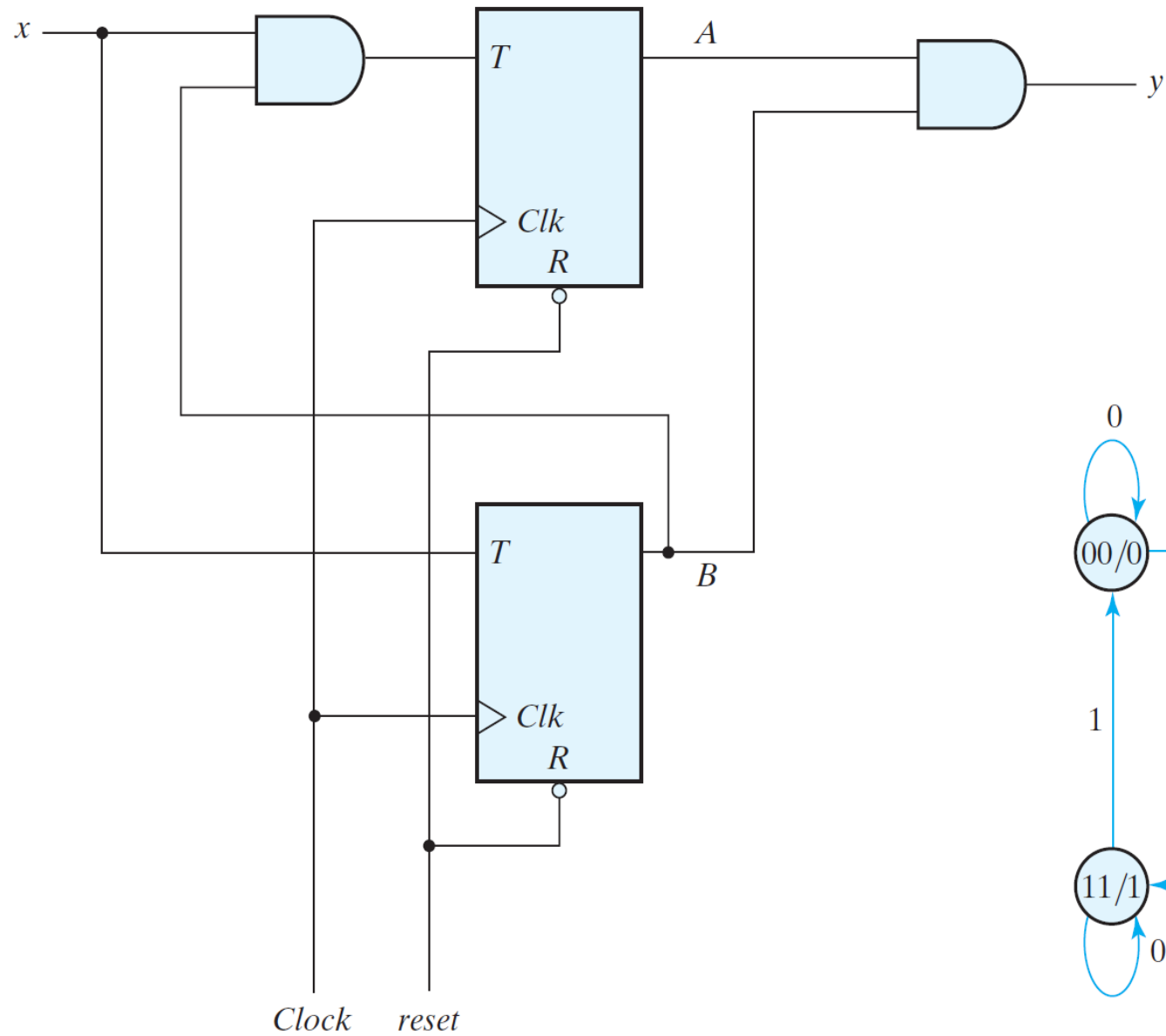
$$K_B = (A \oplus x)'$$

***JK* Flip-Flop**

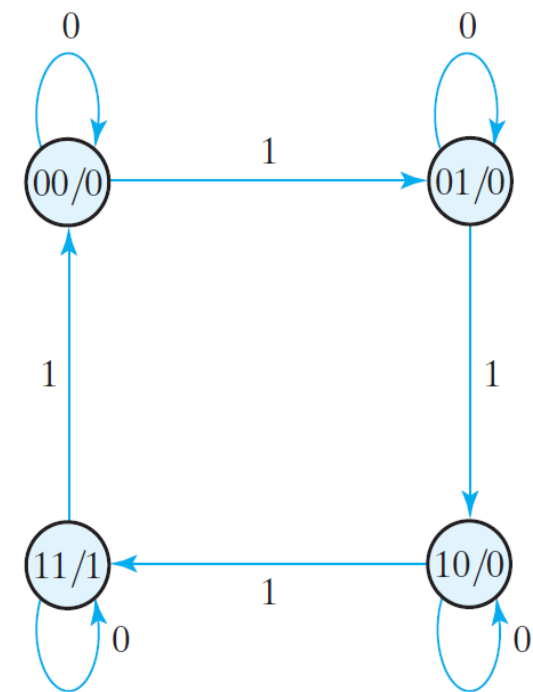
<i>J</i>	<i>K</i>	<i>Q(t + 1)</i>	
0	0	$Q(t)$	No change
0	1	0	Reset
1	0	1	Set
1	1	$Q'(t)$	Complement



Ex 3



(a) Circuit diagram



(b) State diagram

State Table for Sequential Circuit with T Flip-Flops

Present State		Input	Next State		Output
A	B		A	B	
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	1	0
0	1	1	1	0	0
1	0	0	1	0	0
1	0	1	1	1	0
1	1	0	1	1	1
1	1	1	0	0	1

Ex 4

Implement a D-flip flop using a JN-flip flop where JN is defined as follows:

J	N	$Q(t+1)$
0	0	0
0	1	$Q(t)$
1	0	$Q'(t)$
1	1	1

$Q(t)$	$Q(t+1)$	J	N
0	0	0	x
0	1	1	x
1	0	x	0
1	1	x	1

