SR flip-flop

S(t)	R(t)	Q(t+1)	Operation
0	0	Q(t)	No Change
0	1	0	Reset
1	0	1	Set
1	1	?	Undefined

Characteristic Table

Q(t+1) = S(t) + R'(t)Q(t)

Characteristic equation

JK flip-flop

J(t)	K(t)	Q(t+1)	Operation
0	0	Q(t)	No Change
0	1	0	Reset
1	0	1	Set
1	1	Q'(t)	Complement

Characteristic Table

Q(t+1) = J(t)Q'(t) + K'(t)Q(t)

Characteristic equation

D flip-flop

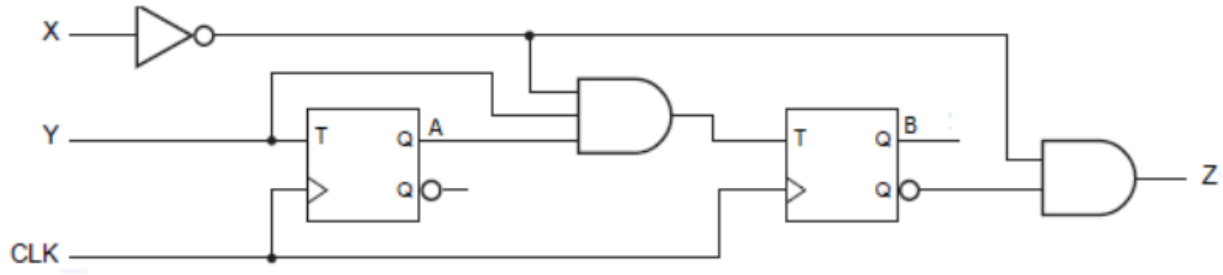
D(t)	Q(t+1)	Operation
0	0	Reset
1	1	Set

Characteristic Table

Q(t+1) = D(t)

Characteristic equation

1.j

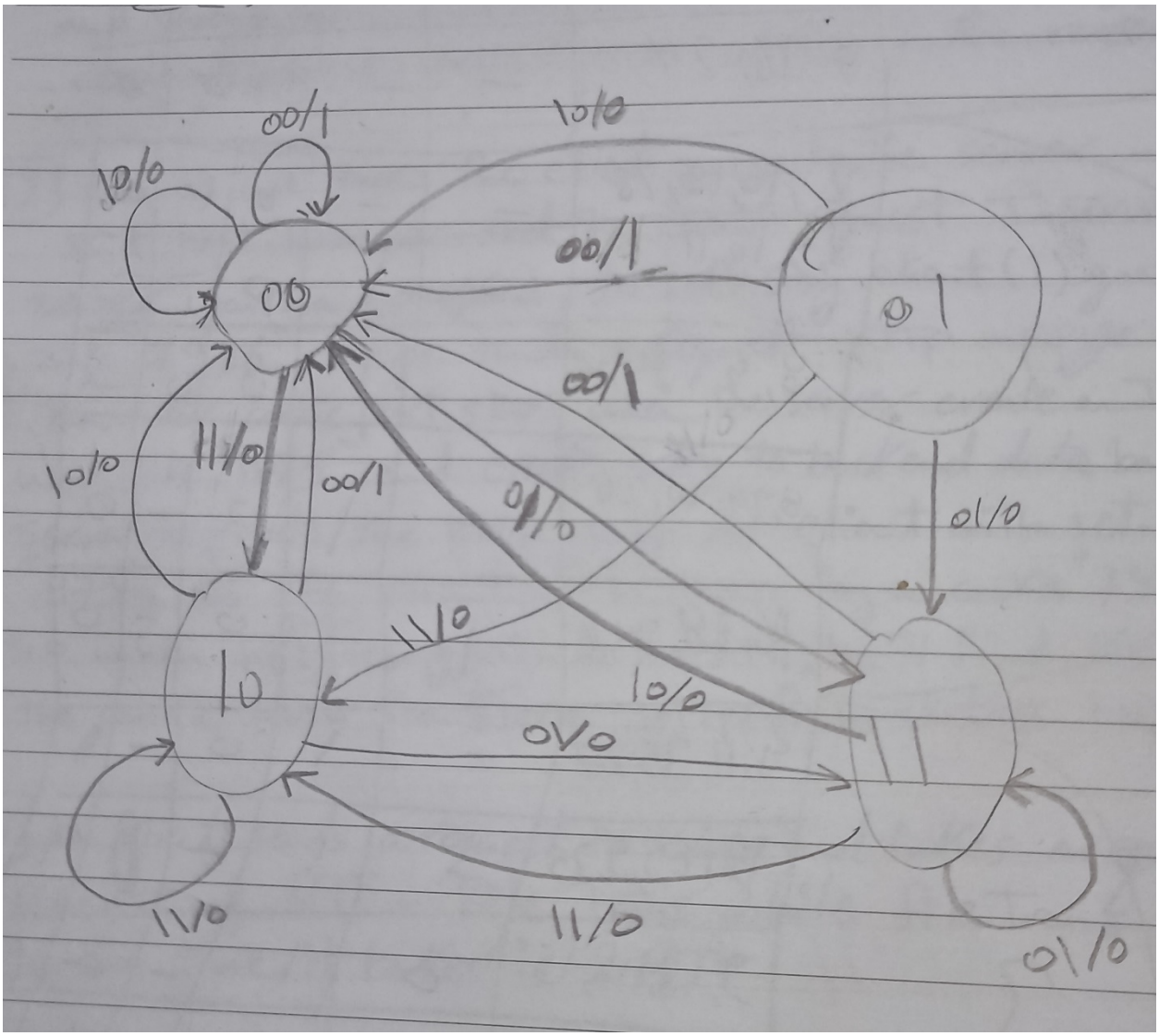


State equations

T_A = Y , $T_B = \bar{X}$.A.Y

Z = $\bar{X}.\bar{B}$

Present State		Inputs							Next State		Output
A(t)	B(t)	X	Y	$\bar{X}$	$\bar{B}$	T_A	T_B	A	A(t+1)	B(t+1)	Z
0	0	0	0	1	1	0	0	0	0	0	1
0	0	0	1	1	0	1	1	1	1	1	0
0	0	1	0	0	1	0	0	0	0	0	0
0	0	1	1	0	1	1	0	1	1	0	0
0	1	0	0	1	1	0	0	0	0	0	1
0	1	0	1	1	0	1	1	1	1	1	0
0	1	1	0	0	1	0	0	0	0	0	0
0	1	1	1	0	1	1	0	1	1	0	0
1	0	0	0	1	1	0	0	0	0	0	1
1	0	0	1	1	0	1	1	1	1	1	0
1	0	1	0	0	1	0	0	0	0	0	0
1	0	1	1	0	1	1	0	1	1	0	0
1	1	0	0	1	1	0	0	0	0	0	1
1	1	0	1	1	0	1	1	1	1	1	0
1	1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	1	1	0	1	1	0	0



3.d

Present state	Input X	Next state	Output Z
00	0	00	0
00	1	01	1
01	0	11	0
01	1	01	0
10	0	10	0
10	1	11	1
11	0	01	0
11	1	10	0

SR flip-flop

Present State		Input						Next State		Output
A(t)	B(t)	X	$\bar{B}$	S_A	R_A	S_B	R_B	A(t+1)	B(t+1)	Z
0	0	0	1	0	X	0	X	0	0	0
0	0	1	1	0	X	1	0	0	1	1
0	1	0	0	1	0	X	0	1	1	0
0	1	1	0	0	X	X	0	0	1	0
1	0	0	1	X	0	0	X	1	0	0
1	0	1	1	X	0	1	0	1	1	1
1	1	0	0	0	1	0	X	0	1	0
1	1	1	0	X	0	X	1	1	0	0

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

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

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

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

S_t	R_t	Q(t)	Q(t+1)
0	X	0	0
0	1	X	0
1	0	X	1
X	1	X	0

State equations

$S_A = \bar{A}.B.\bar{X}$

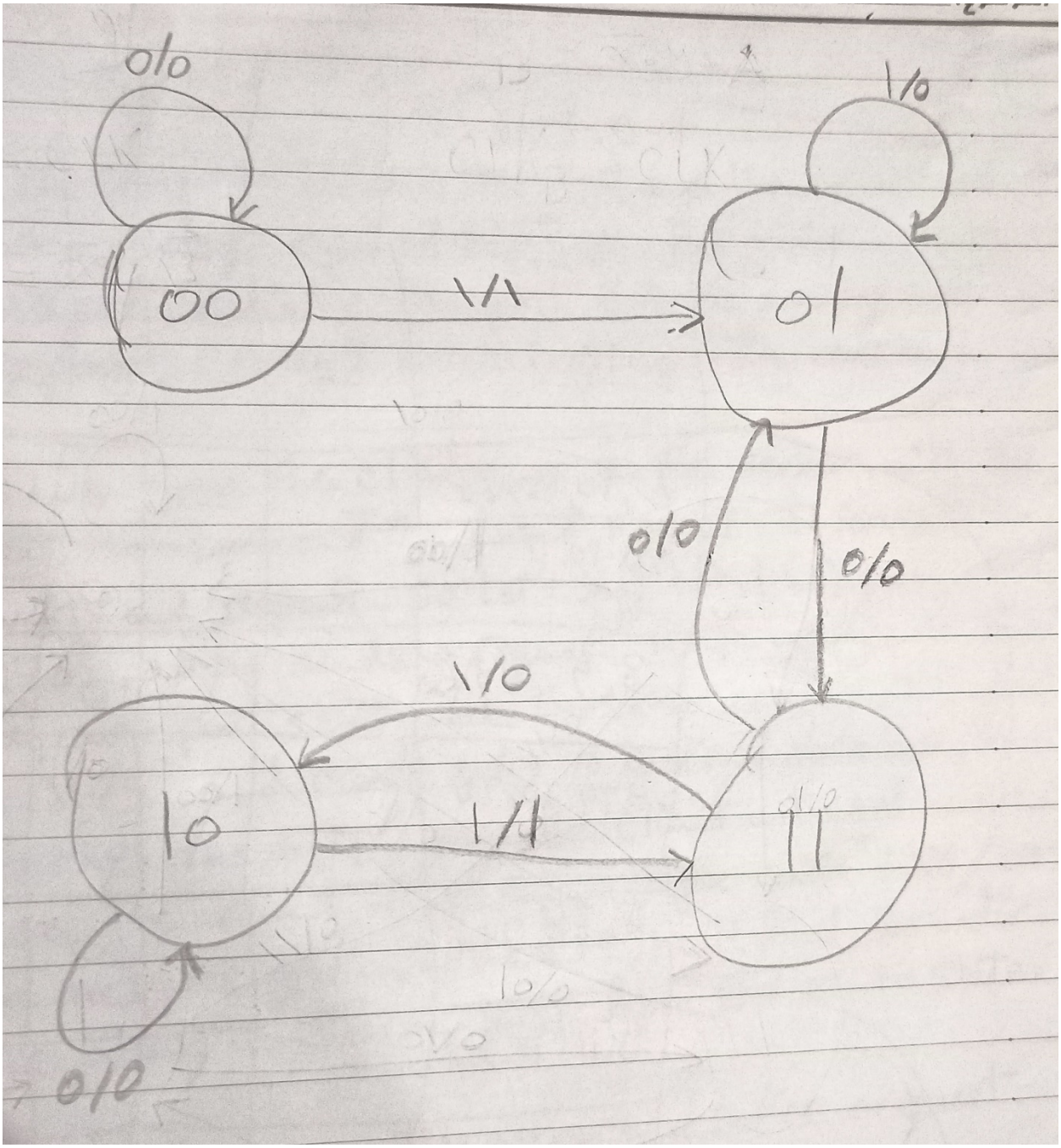
$R_A = A.B.\bar{X}$

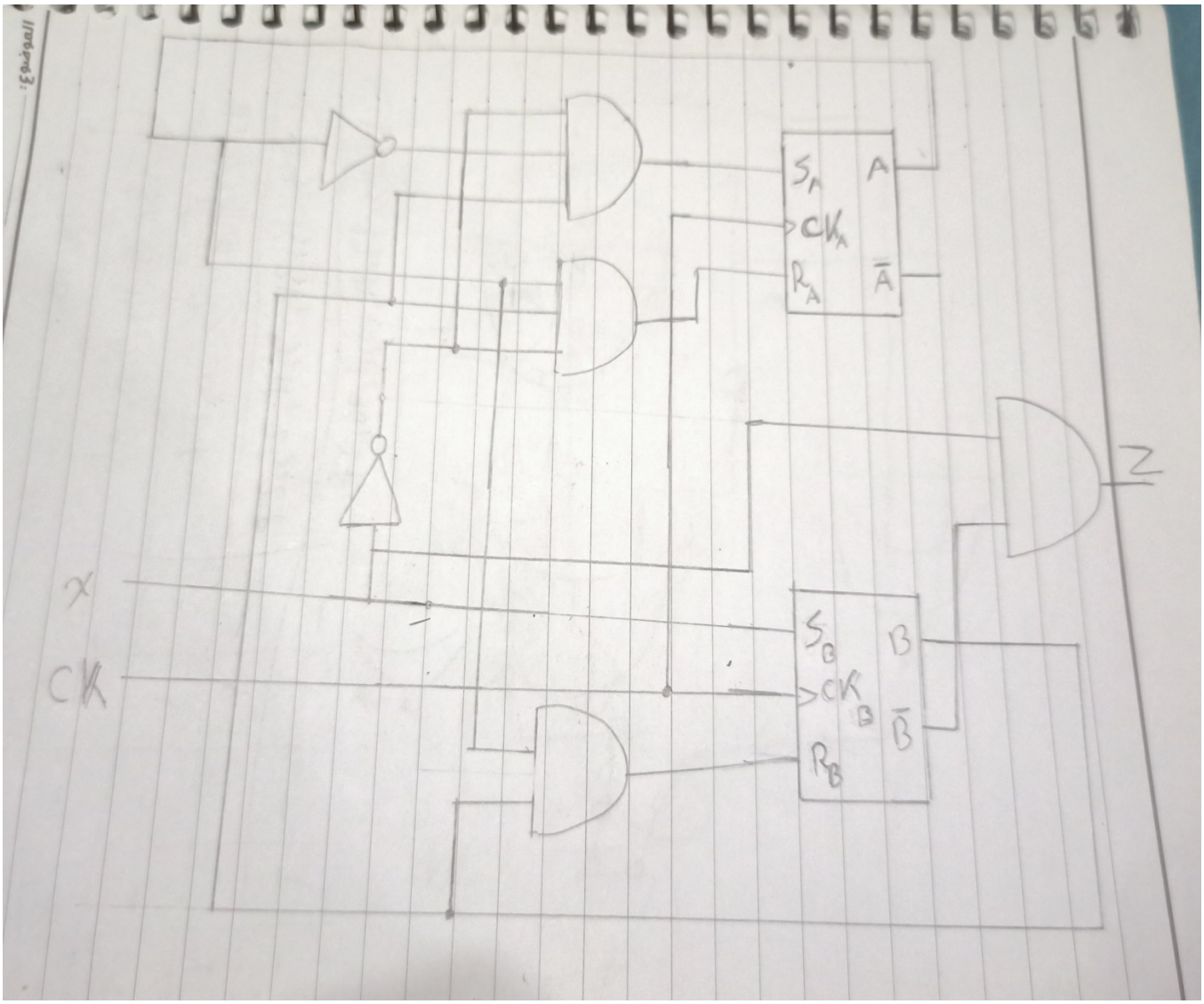
$S_B = X$

$R_B = A.B$

$Z = \bar{B}.X$

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




S_A
A
CK_A
R_A
$\bar{A}$
Z
x
CK
S_B
B
CK_B
R_B
$\bar{B}$

JK flip-flop

Present State		Input						Next State		Output
A(t)	B(t)	X	$\bar{B}$	J_A	K_A	J_B	K_B	A(t+1)	B(t+1)	Z
0	0	0	1	0	X	0	X	0	0	0
0	0	1	1	0	X	1	0	0	1	1
0	1	0	0	1	0	X	0	1	1	0
0	1	1	0	0	X	X	0	0	1	0
1	0	0	1	X	0	0	X	1	0	0
1	0	1	1	X	0	1	0	1	1	1
1	1	0	0	X	1	X	0	0	1	0
1	1	1	0	X	0	X	1	1	0	0

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

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

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

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

State equations

J_A = B.$\bar{X}$

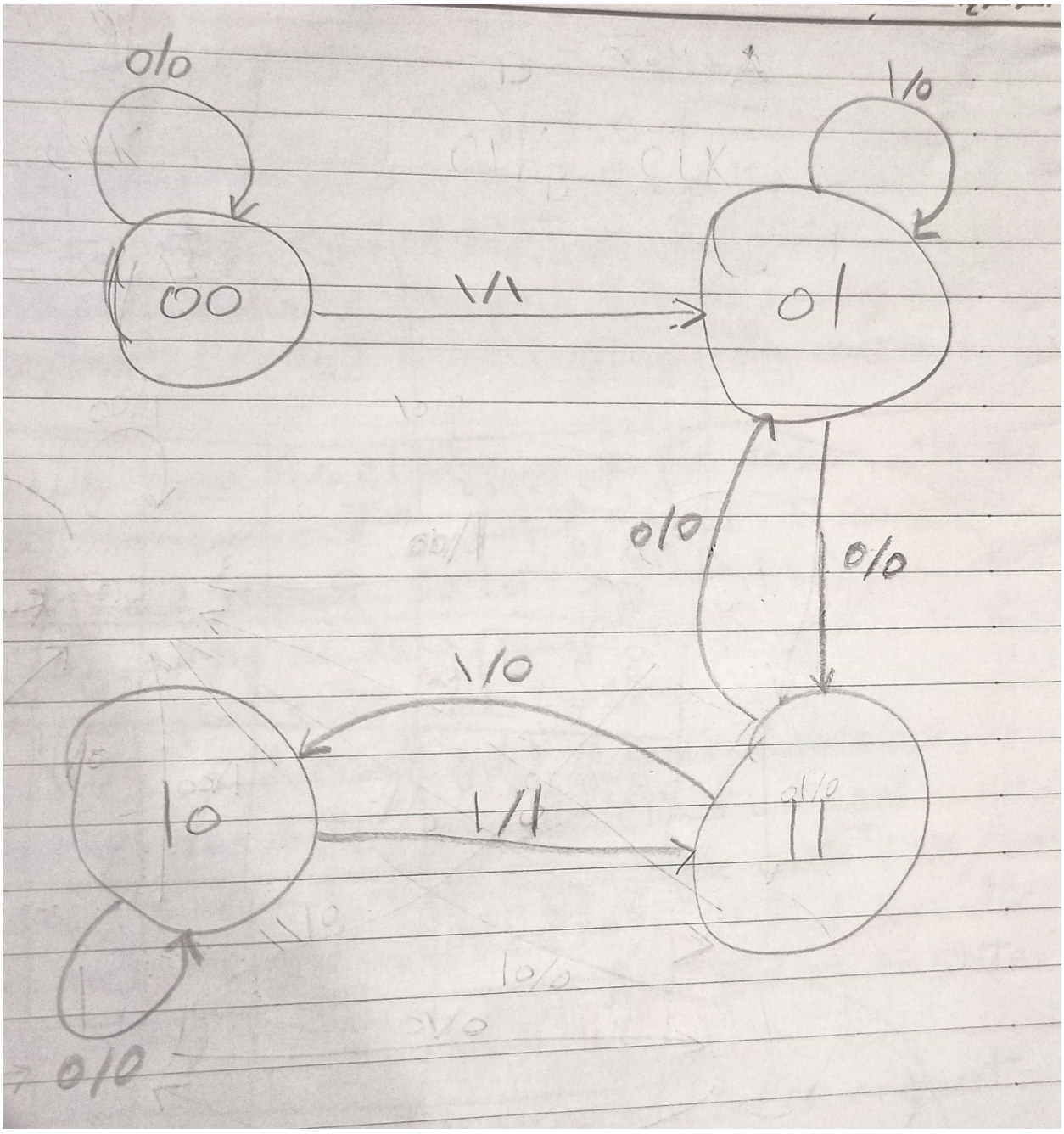
K_A =A.B.$\bar{X}$

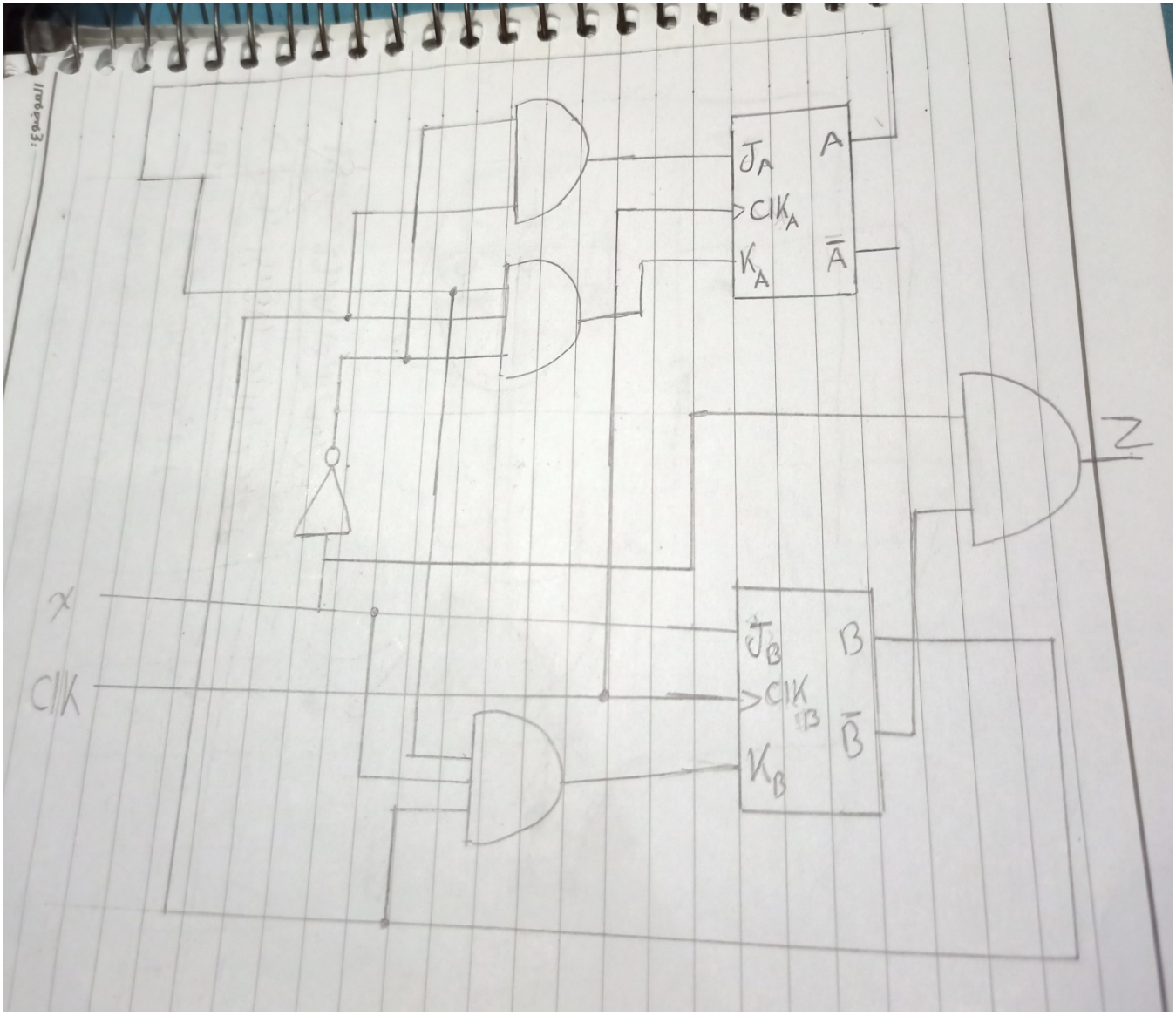
J_B =X

K_B = A.B.X

Z = $\bar{B}$.X

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




J_A
A
C|K
K_A
$\bar{A}$
Z
x
C|K
J_B
B
C|K
K_B
$\bar{B}$