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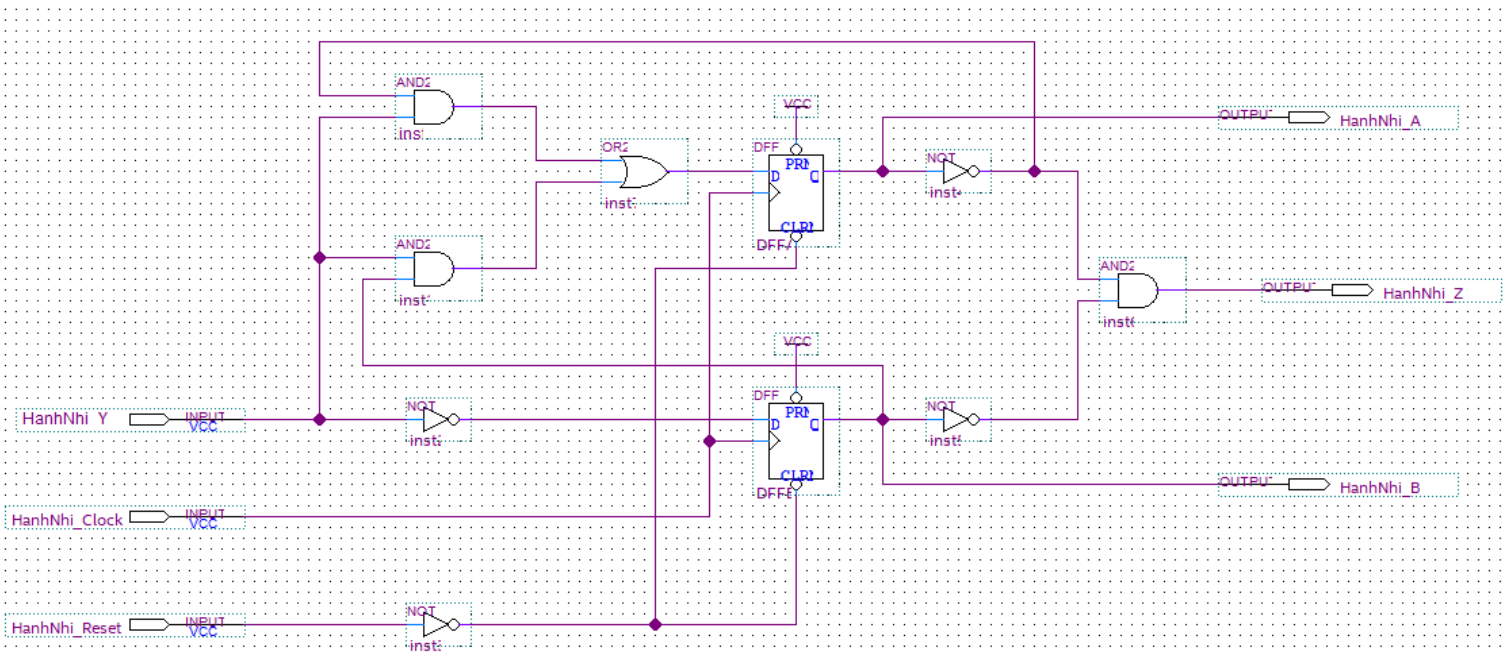
MSSV: 2131209002

Assignment 1

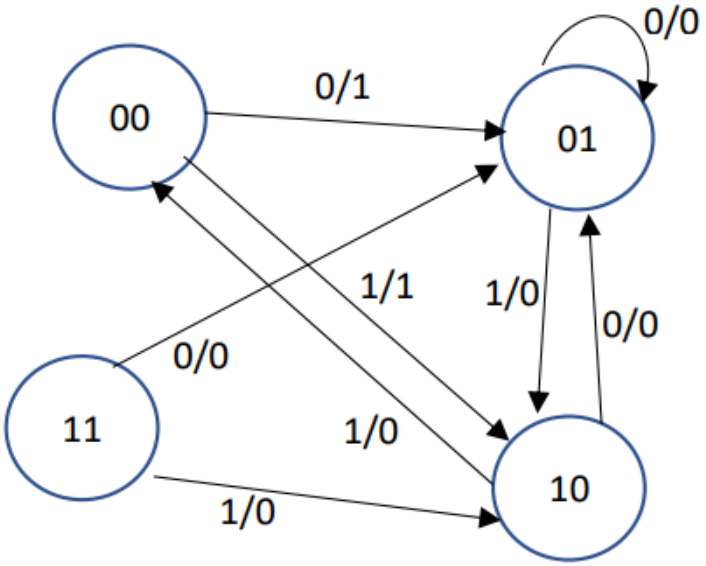
a) Draw the logic diagram of the circuit:



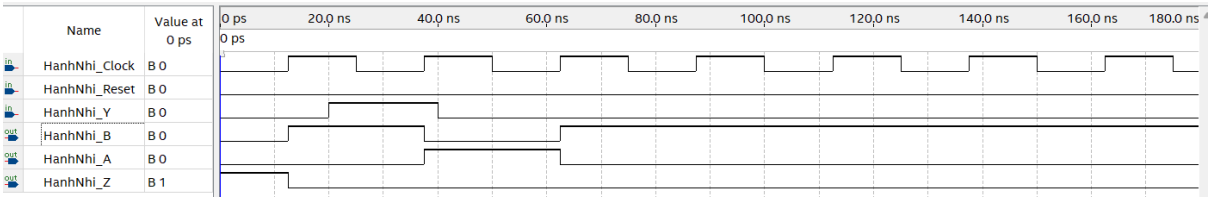
b) Derive the state table:

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

c) Derive the state diagram:



d) Simulate the circuit with initial state AB = 00 and input sequence Y = 0100:



Assignment 2

a) Draw the logic diagram of the circuit:

The circuit has 4 states A, B, C and D, one input X and one output Y.

Present State	X	Next State	Y
A	0	B	1
A	1	A	1
B	0	B	0
B	1	C	0
C	0	D	0
C	1	C	0
D	0	D	0
D	1	A	0

b) State assignment with using binary codes

Four states: Using 2 flip-flops State assignment: A: 00 B: 01 C: 10 D:11

Present State	X	Next State	Y
00	0	01	1
00	1	00	1
01	0	01	0
01	1	10	0
10	0	11	0
10	1	10	0
11	0	11	0
11	1	00	0

Using 2 flip-flops named A and B:

Present State A	B	X	Next State A	B	Y
0	0	0	0	1	1
0	0	1	0	0	1
0	1	0	0	1	0
0	1	1	1	0	0
1	0	0	1	1	0
1	0	1	1	0	0
1	1	0	1	1	0
1	1	1	0	0	0

D_A D_B

c) Draw the logic diagram of the circuit

- Input equation for the FF A: DA

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

$$D_A = A\bar{B} + A\bar{X} + \bar{A}BX$$

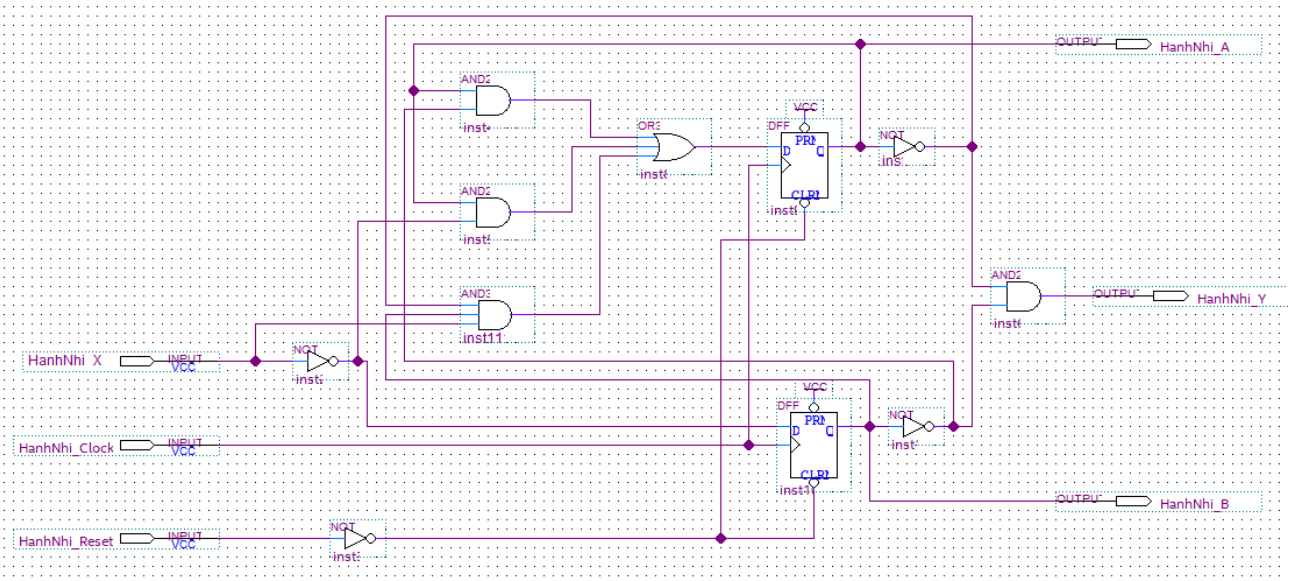
- Input equation for the FF B: DB

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

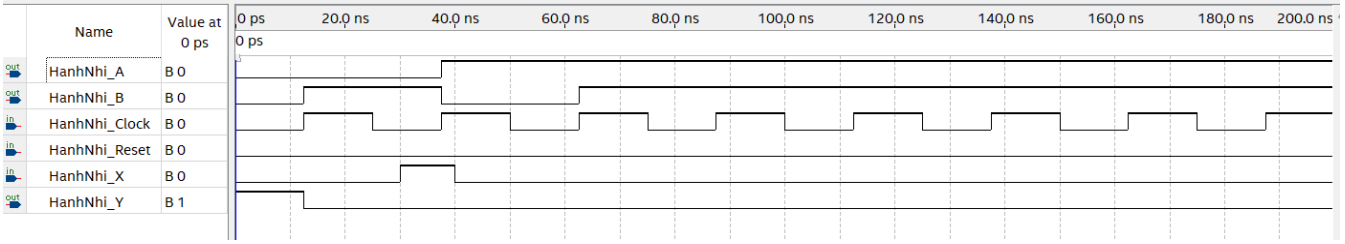
- Input equation for the output: Y

Y		BX			
		00	01	11	10
A	0	1	1		
	1				

$$Y = \bar{A}\bar{B}$$



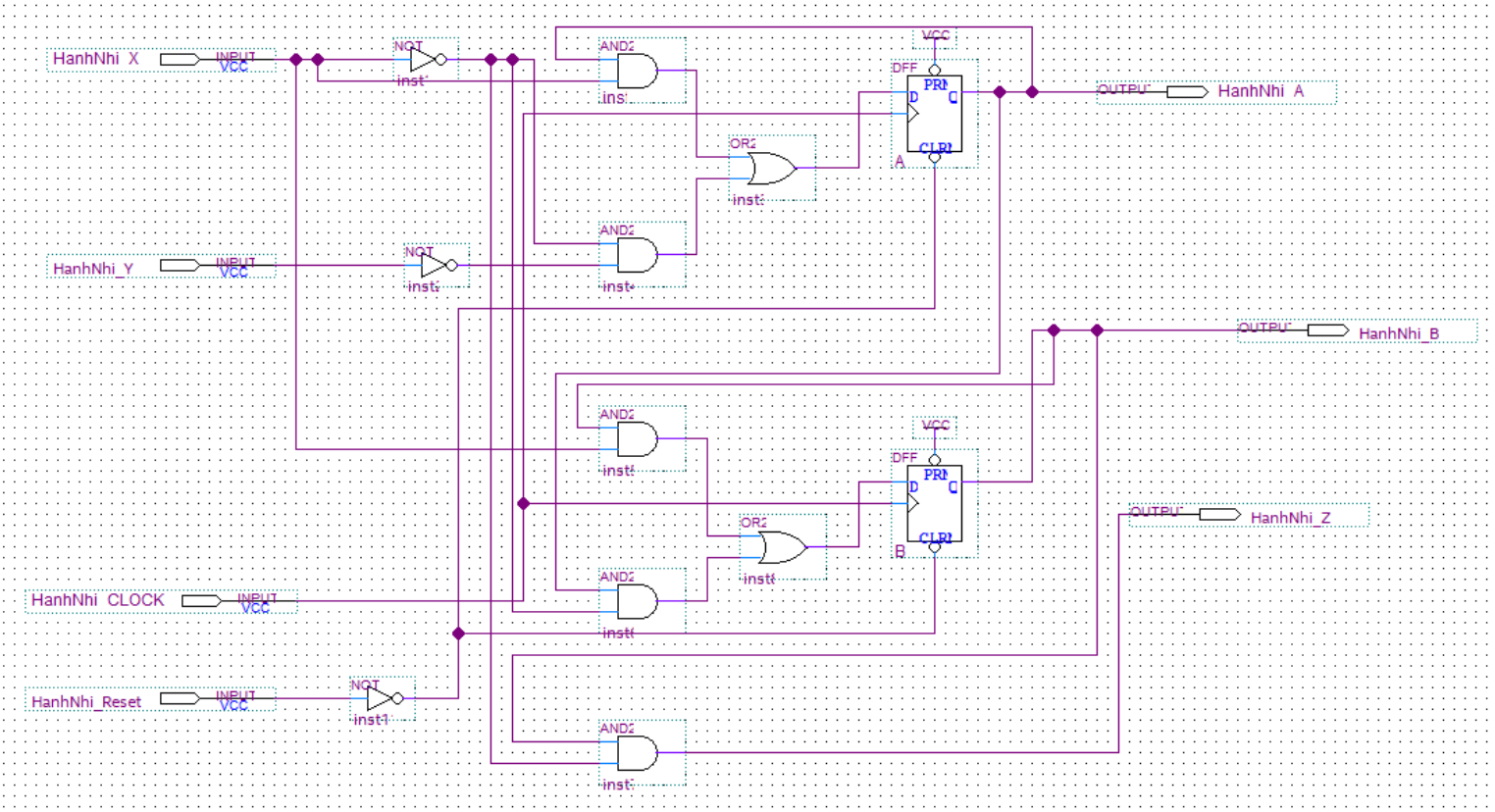
d) Simulate the circuit and check the output with initial state AB = 00 and input sequence X = 0100



Assignment 3

$$D_A = XA + \overline{X}\,\overline{Y},\quad D_B = XB + \overline{X}A,\quad Z = \overline{X}B$$

a) Draw the logic diagram of the circuit:

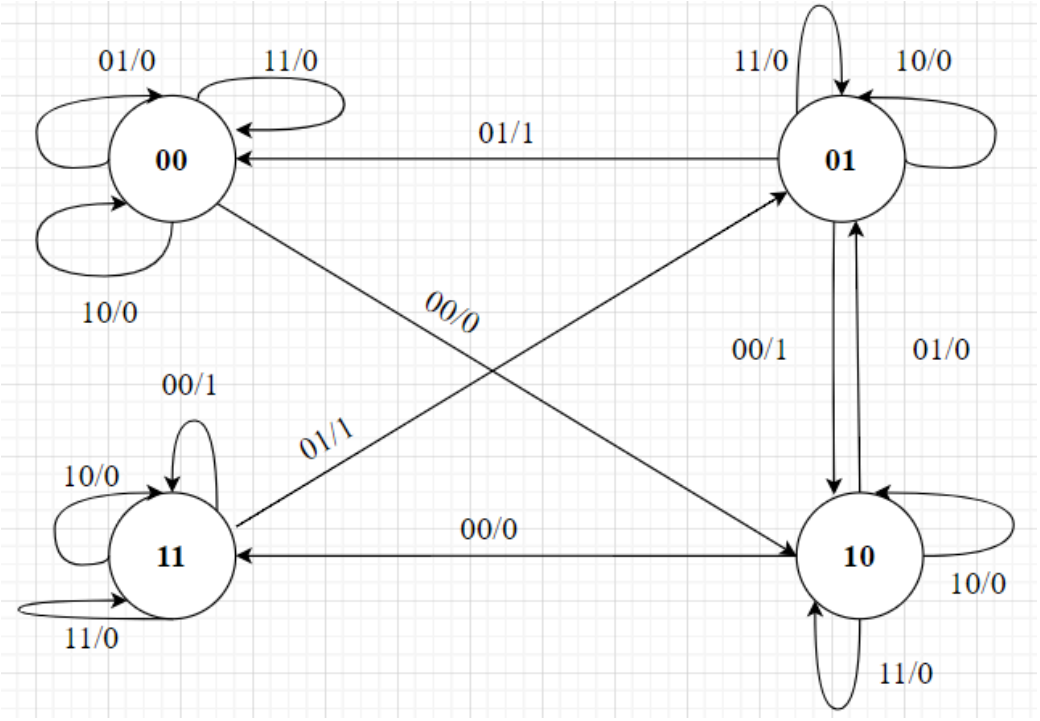


b) Derive the state table:

Present state		Input		Next state		Output
A	B	X	Y	DA	DB	Z
0	0	0	0	1	0	0
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	0	1	1	0	0	0
0	1	0	0	1	0	1
0	1	0	1	0	0	1
0	1	1	0	0	1	0
0	1	1	1	0	1	0
1	0	0	0	1	1	0

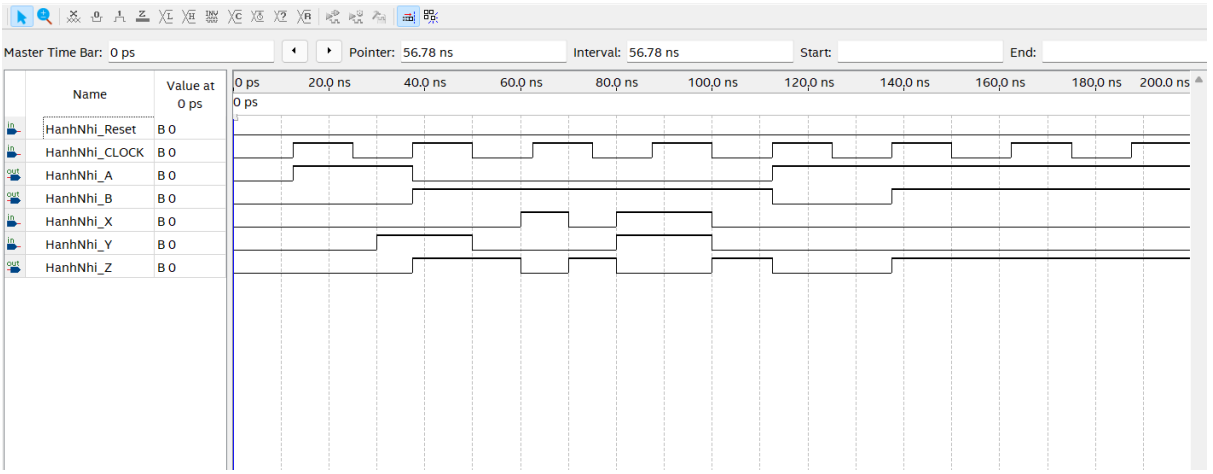
1	0	0	1	0	1	0
1	0	1	0	1	0	0
1	0	1	1	1	0	0
1	1	0	0	1	1	1
1	1	0	1	0	1	1
1	1	1	0	1	1	0
1	1	1	1	1	1	0

c) Derive the state diagram:

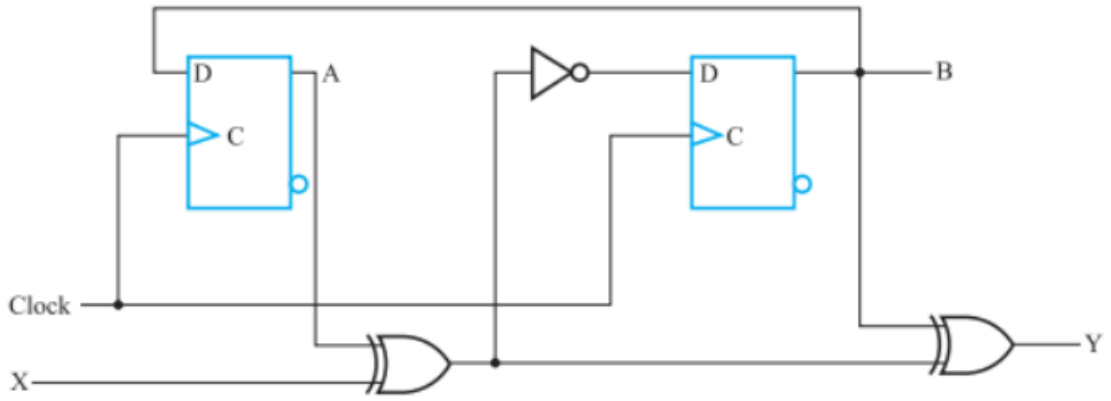


d) Simulate the circuit:

- Initial state: 00
- Input sequence: (Given by you)
- Check the output Z with the state table



Assignment 4



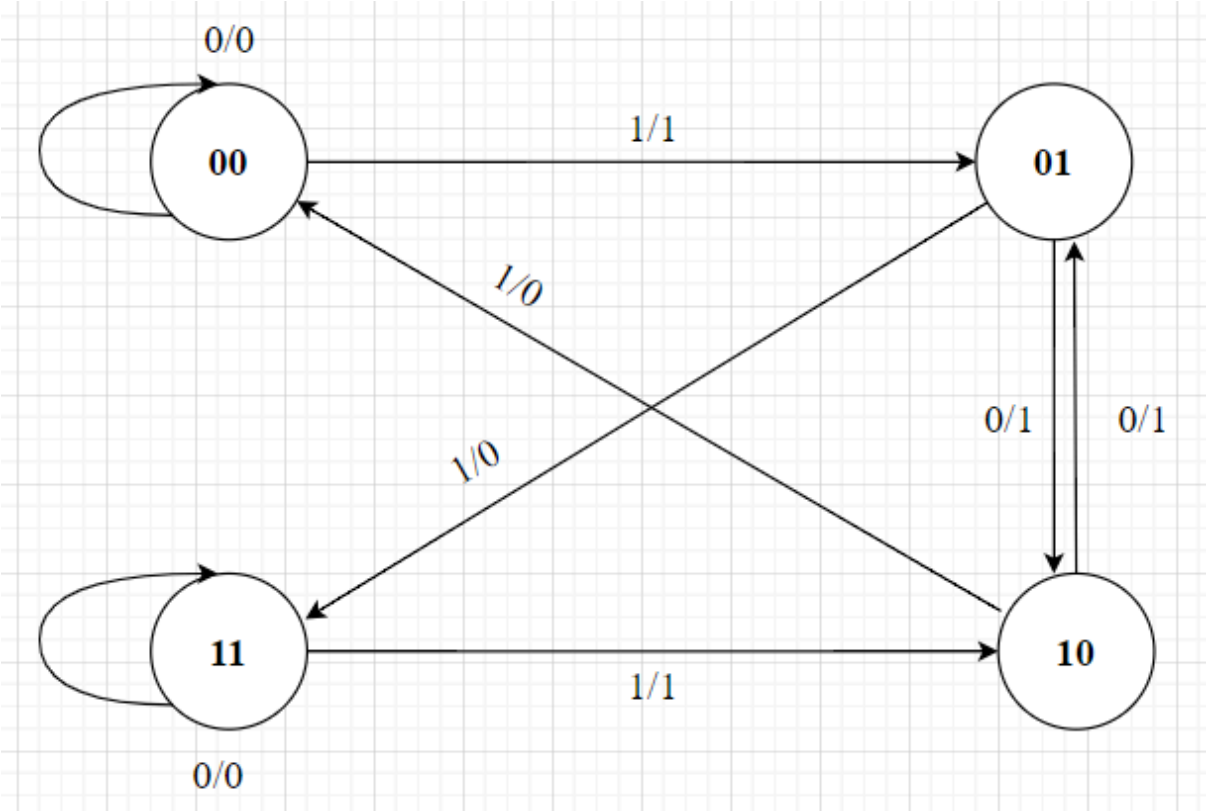
a) The input equations are:

- DA = B
- DB = (X ⊕ A)'
- Y = (X ⊕ A) ⊕ B

b) Derive the state table:

Present state		Input	Next state		Output
A	**B**	**X**	**DA**	**DB**	**Y**
0	0	0	0	0	0
0	0	1	0	1	1
0	1	0	1	0	1
0	1	1	1	1	0
1	0	0	0	1	1
1	0	1	0	0	0
1	1	0	1	1	0
1	1	1	1	0	1

c) Derive the state diagram:

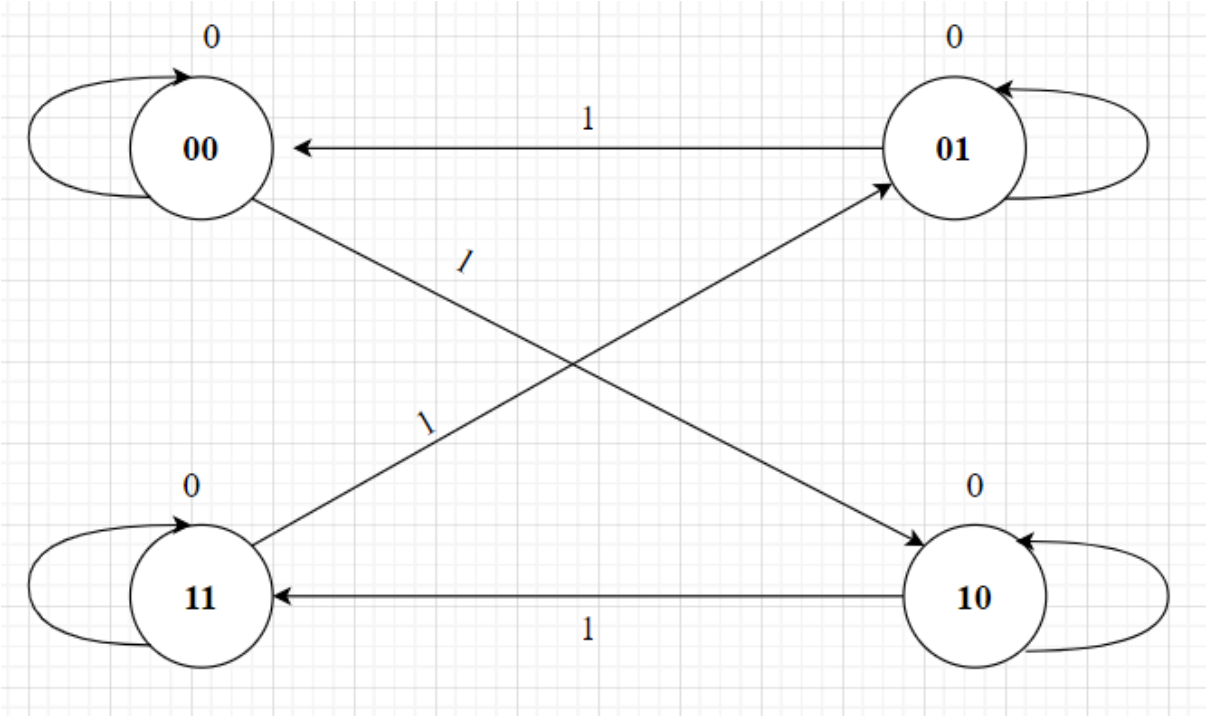


Assignment 5

a) Derive the state table:

Present state		Input	Next state	
A	**B**	**X**	**DA**	**DB**
0	0	0	0	0
0	0	1	1	0
0	1	0	0	1
0	1	1	0	0
1	0	0	1	0
1	0	1	1	1
1	1	0	1	1
1	1	1	0	1

b) Derive the state diagram:



c) Simplify the function as much as possible:

- Input equation for the FF A: D_A

DA		BX			
		00	**01**	**11**	**10**
A	**0**		1		
	1	1	1		1

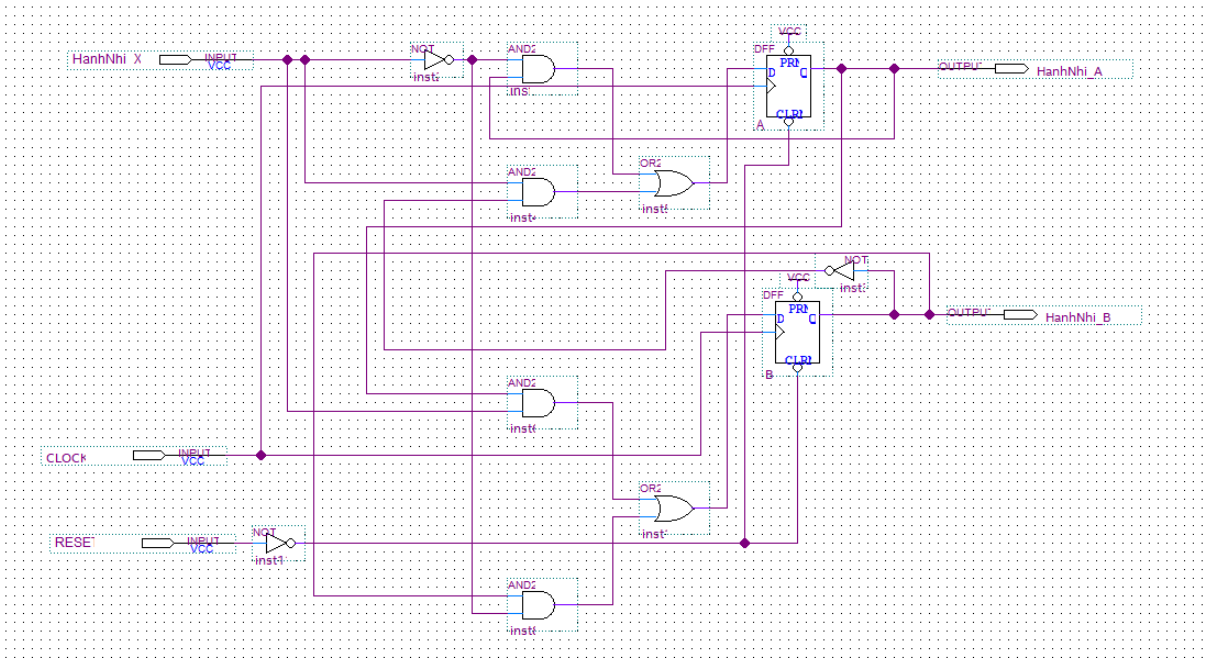
DA = AX' + B'X

- Input equation for the FF B: D_B

DB		BX			
		00	**01**	**11**	**10**
A	**0**				1
	1		1	1	1

D_B = AX + BX'

d) Draw the logic diagram of the circuit:



e) Simulate the circuit and check the output: