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ASSIGNMENT-4

Date: 12/3/22

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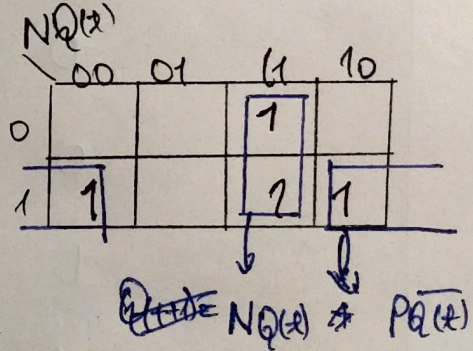
Q1 (a) Characteristic table →

P	N	Q(t+1)
0	0	0
0	1	Q(t)
1	0	$\overline{Q(t)}$
1	1	1

(b)

P	N	Q(t)	Q(t+1)	
0	0	0	0	0
0	0	1	0	
0	1	0	0	Q(t)
0	1	1	1	
1	0	0	1	$\overline{Q(t)}$
1	0	1	0	
1	1	0	1	1
1	1	1	1	

Characteristic equation



$\Rightarrow$ $Q(t+1) = NQ(t) + P\overline{Q(t)}$

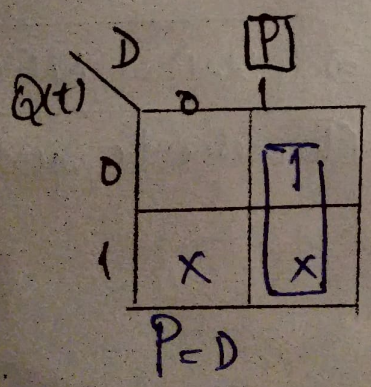
Characteristic equation

(c) Excitation table:

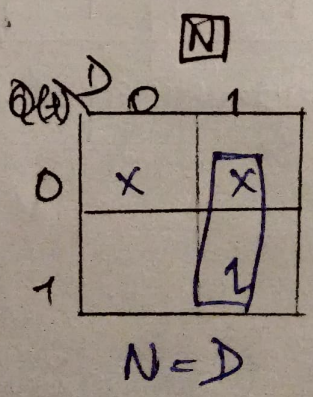
Q(t)	P	N	Q(t+1)
0	0	x	0
0	1	x	1
1	x	0	0
1	x	1	1

(d) Excitation table with D: $D = Q(t+1)$

Q(t)	D	Q(t+1)	P	N
0	0	0	0	x
0	1	1	1	x
1	0	0	x	0
1	1	1	x	1



$P = D$



$N = D$

⇒ Connect both P and N to D

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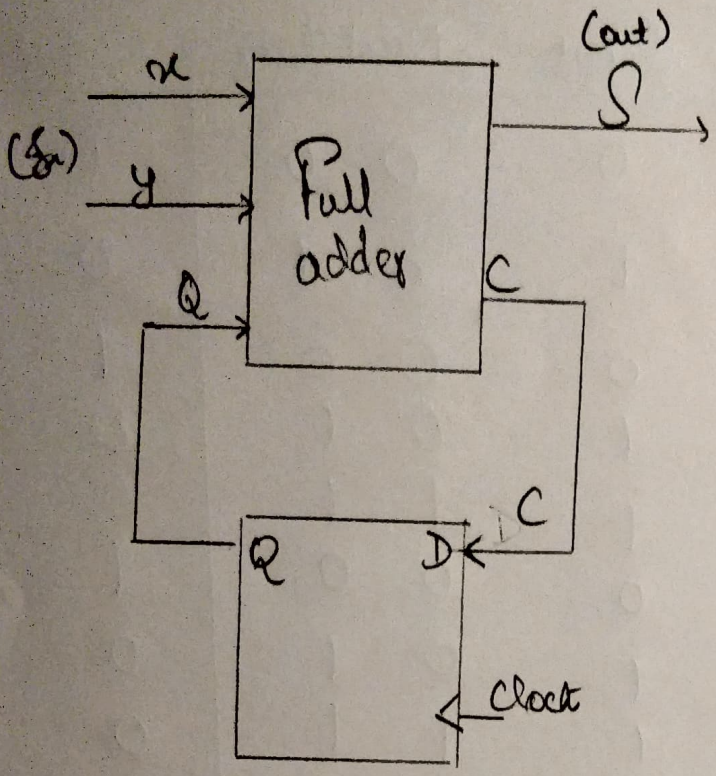
Q2



State table

Present Q(t)	Input x	Input y	Next Q(t+1)	Output S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

~~S = A ⊕ B ⊕ Q~~

$S = x \oplus y \oplus Q$

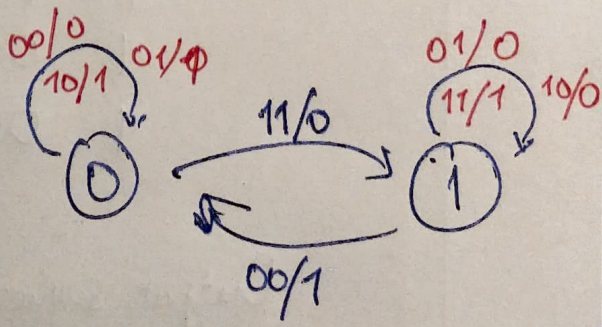
$C = xy + yQ + xQ$

Since $D = Q(t+1)$

$Q(t+1) = D = xy + yQ + xQ$

$= C$

State diagram -



Q3 (a)

Present State		Input	Next State		Output
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	0	1
0	0	1	0	1	0
0	1	1	1	1	0
1	1	0	0	0	1
0	0	1	0	1	0
0	1	1	1	1	0
1.	1	1	1	0	0
1	0	0	0	0	1
0	0	1	0	1	0
0	1	1	1	1	0
1	1	1	1	0	0
1	0	1	1	0	0
1	0	0	0	0	1

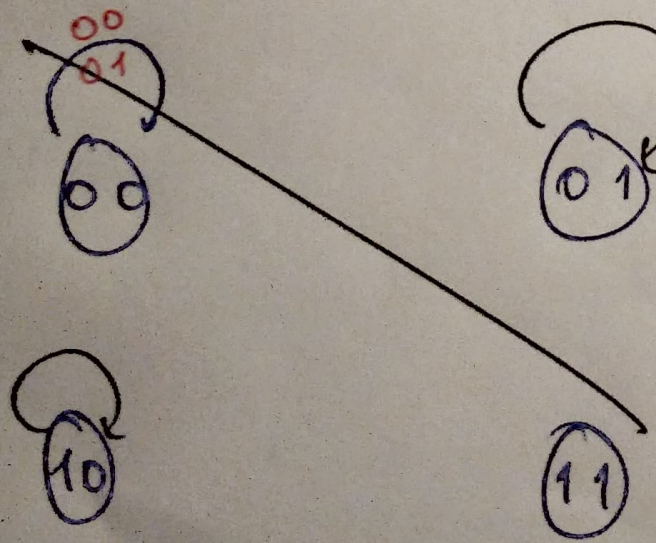
Output sequence → 0010010 0001 00001

Q3 (b)

Present state	Input	Next state	Output
a	0	f	0
f	1	b	1
b	1	c	0
c	1	e	0
e	0	d	0
d	0	g	1
g	1	h	1
h	0	g	1
g	0	g	0
g	1	h	1
h	1	ag	0

Output sequence → 01000 111 010

Q4



Q4 E=0 , Next State = Present State (No change)

E=1, F=1 ⇒

Present	Next
00	→ 01
01	→ 10
10	→ 11
11	→ 00

E=1, F=0 ⇒

00	→ 11
~~10~~	~~→ 01~~
11	→ 10
10	→ 01
01	→ 00

Present State A B	Input E F	Next State A^+ B^+	Input to ff J_A K_A	J_B K_B
0 0	0 0	0 0	0 x	0 x
0 0	0 1	0 0	0 x	0 x
0 0	1 0	1 1	1 x	1 x
0 0	1 1	0 1	0 x	1 x
0 1	0 0	0 1	0 x	x 0
0 1	0 1	0 1	0 x	x 0
0 1	1 0	0 0	0 x	x 1
0 1	1 1	1 0	1 x	x 1
1 0	0 0	1 0	x 0	0 x
1 0	0 1	1 0	x 0	0 x
1 0	1 0	0 1	x 1	1 x
1 0	1 1	1 1	x 0	1 x
1 1	0 0	1 1	x 0	x 0
1 1	0 1	1 1	x 0	x 0
1 1	1 0	1 0	x 0	x 1
1 1	1 1	0 0	x 1	x 1

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J_A

AB \ EF	00	01	11	10
00				1
01			1	
11	x	x	x	x
10	x	x	x	x

$BE\bar{F}$; $\bar{B}E\bar{F}$

$J_A = BE\bar{F} + \bar{B}E\bar{F}$

$= E(B \odot F)$

K_A

AB \ EF	00	01	11	10
00	x	x	x	x
01	x	x	x	x
11			1	
10				1

BEF ; $\bar{B}E\bar{F}$

$K_A = BEF + \bar{B}E\bar{F}$

$= E(B \odot F)$

J_B

AB \ EF	00	01	11	10
00			1	1
01	x	x	x	x
11	x	x	x	x
10			1	1

$J_B = E$

K_B

AB \ EF	00	01	11	10
00	x	x	x	x
01			1	1
11			1	1
10	x	x	x	x

$K_B = E$

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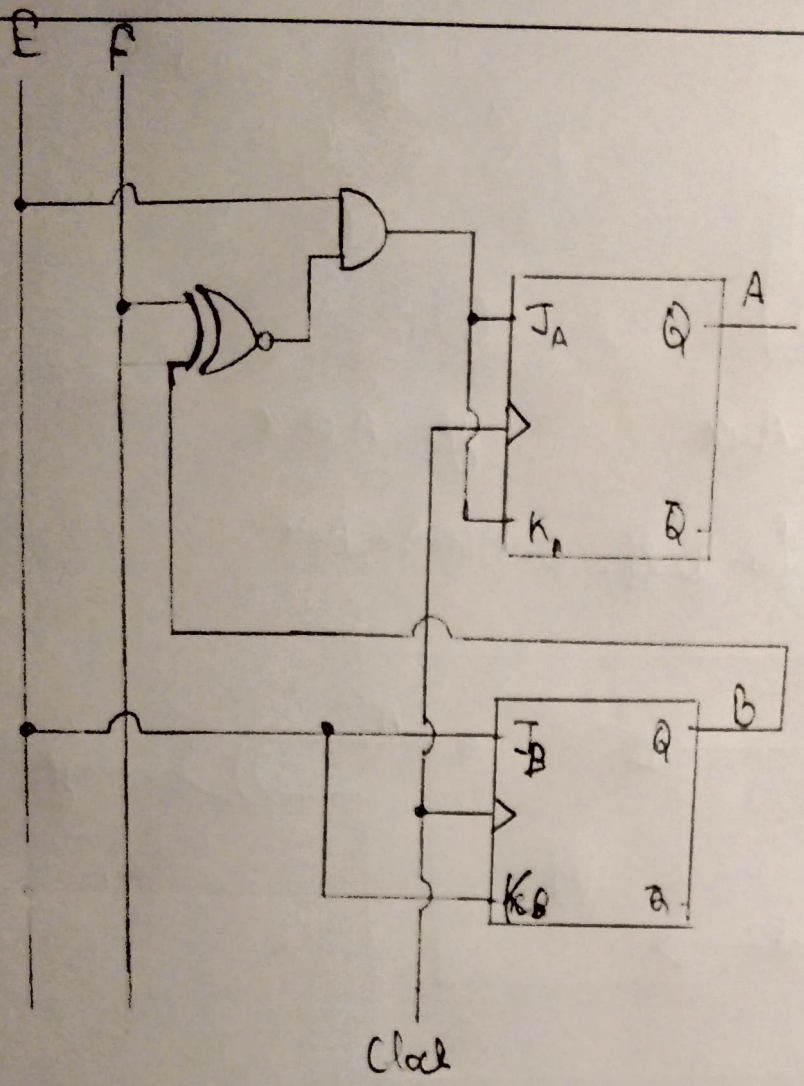

Q5 State table :

Present state A(t)	Input x	Next State A(t+1)	Output y
0	0	0	0
0	1	1	1
1	0	1	1
1	1	1	0

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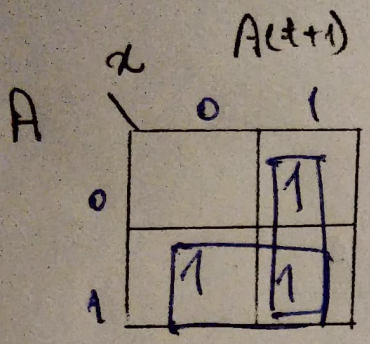
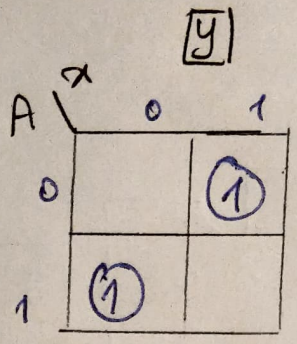
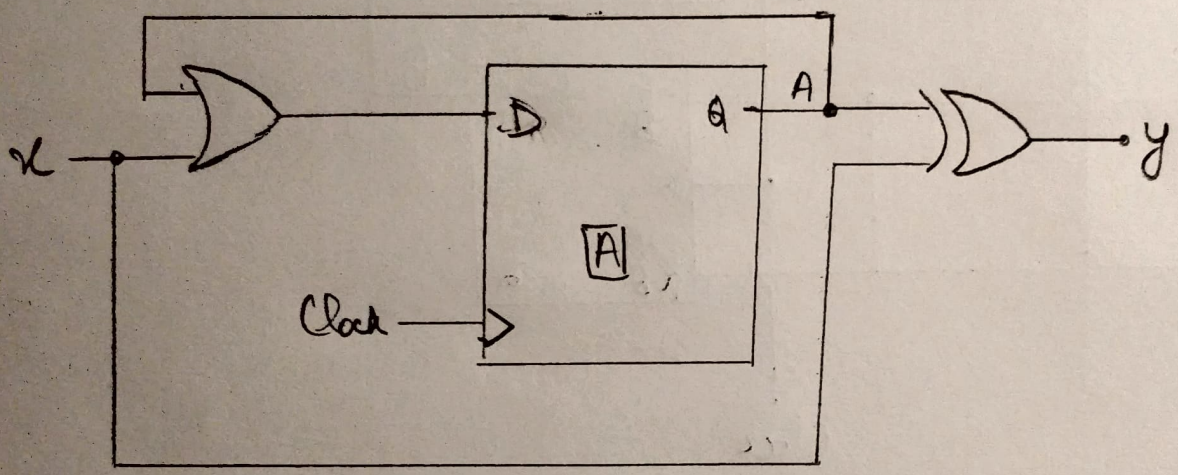




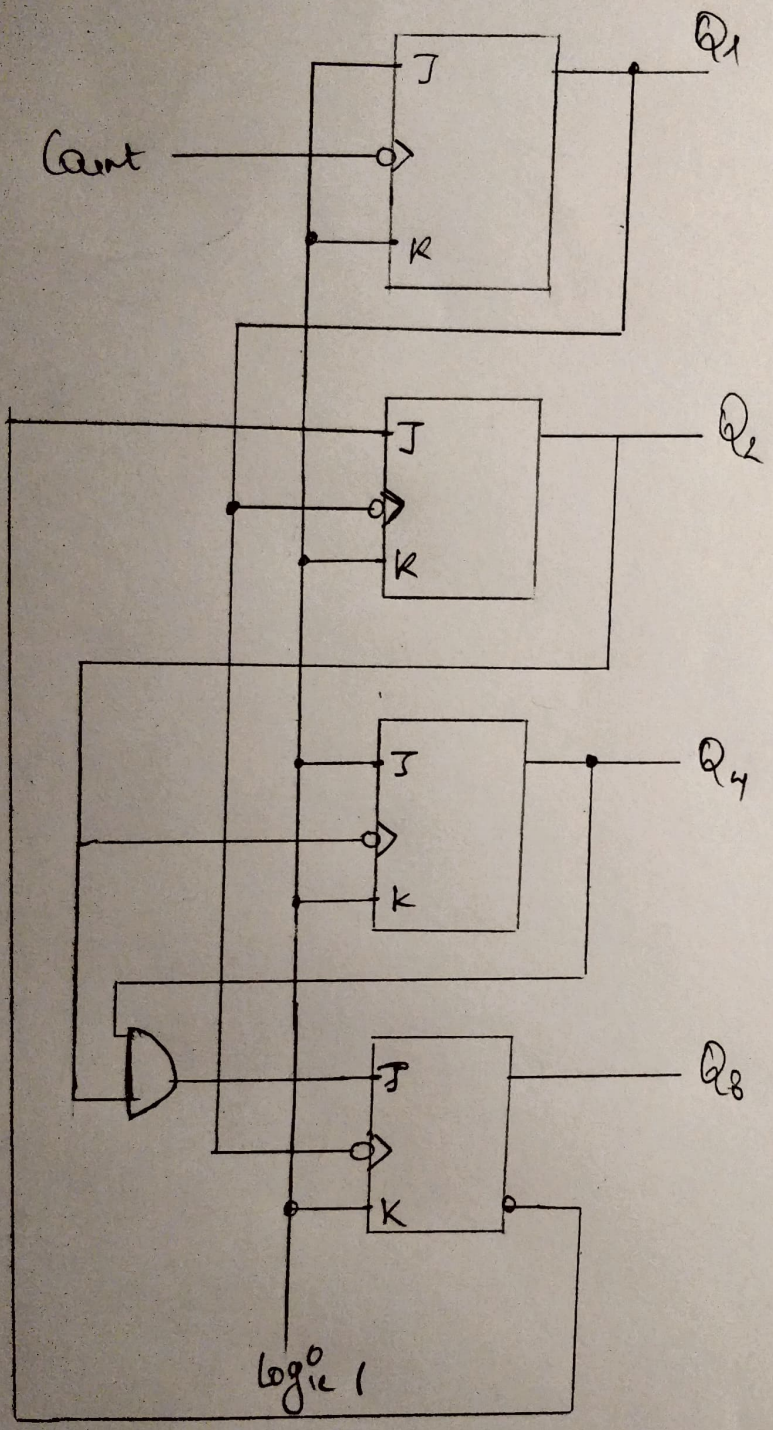
$A(t+1) = A + x$

$y = A \oplus x$

for D ff, $D = A(t+1) = A + x$



Q6



When noise signals result in any unused state, it goes to the next unused state and then resets to used values.

Unused	Next state	Next state
$Q_8\ Q_4\ Q_2\ Q_1$		
1 0 1 0	1 0 1 1	0 1 0 0
1 1 0 0	1 1 0 1	0 1 0 0
1 1 1 0	1 1 1 1	0 0 0 0

Eg → Noise
1100
↓
1101
↓
0100