ELECTRICAL AND ELECTRONICS ENGINEERING
&
COMPUTER ENGINEERING

EEE 248 | CNG 232
Logic Design

21 | SPRING | 22

HW II
Number of Questions: 4

Due: May 09, 2022
Good Luck

Dr. Gürtaç Yemişcioğlu

Student Number:	2453025
Full Name:	Mert Can Bilgin

Question	Achieved	Points
1		16
2		20
3		20
4		28
5		16
TOTAL		100

Question 1

Truth Table

I_1	I_2	I_3	I_4	D_1	D_2	D_3	D_4
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	1
0	1	0	1	0	1	1	0
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	1
1	0	0	0	1	1	1	1
1	0	0	1	1	1	1	0
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	1
1	1	0	0	1	0	0	0
1	1	0	1	1	0	0	1
1	1	1	0	1	0	1	1
1	1	1	1	1	0	1	0

I represents inputs,
D represents outputs.

K-Map for D_1

I_1 \ I_2	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1	1	1	1
10	1	1	1	1

$D_1 = I_1$

K-Map for D_2

I_1I_2 \ I_3I_4	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	0	0	0	0
10	1	1	1	1

$D_2 = I_1'I_2 + I_1I_2' = I_1 \oplus I_2$

K-Map for D_3

I_1I_2 \ I_3I_4	00	01	11	10
00	0	0	1	1
01	1	1	0	0
11	0	0	1	1
10	1	1	0	0

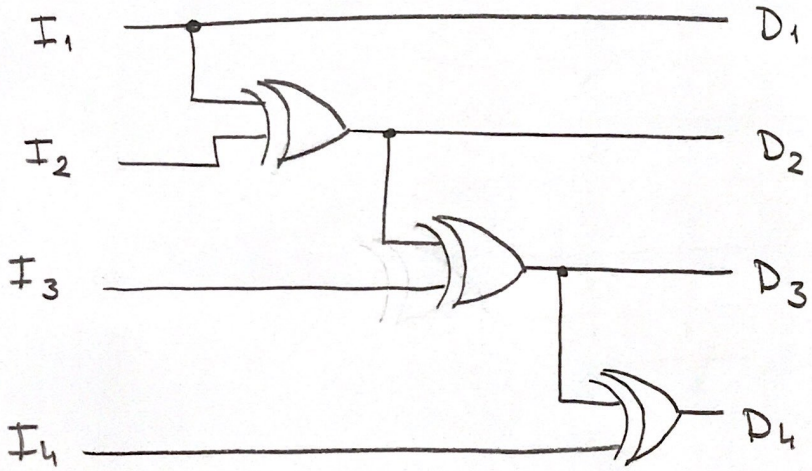
$$D_3 = I_1'I_2'I_3 + I_1'I_2I_3' + I_1I_2I_3 + I_1I_2'I_3'$$

$$\Rightarrow D_3 = I_1 \oplus I_2 \oplus I_3$$

K-Map for D_4

I_1I_2 \ I_3I_4	00	01	11	10
00	0	1	0	1
01	1	0	1	0
11	0	1	0	1
10	1	0	1	0

$$D_4 = I_1 \oplus I_2 \oplus I_3 \oplus I_4$$



Question 2

a) $T_A = x'(A+B) + xB'$

$\Rightarrow x'A + x'B + xB'$

$\Rightarrow x'A + (x \oplus B)$

$\Rightarrow A^+ = [x'A + (x \oplus B)] \oplus A$

$T_B = (A.x)'$

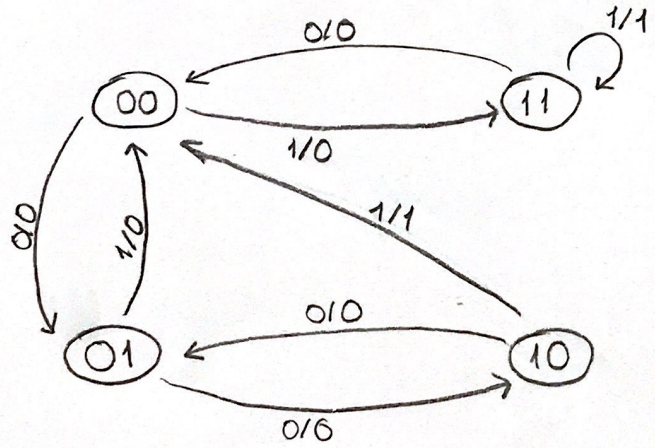
$\Rightarrow B^+ = (A.x)' \oplus B$

and $y = A.x$

b)

Present		input	next		output
A	B	x	A^+	B^+	y
0	0	0	0	1	0
0	0	1	1	1	0
0	1	0	1	0	0
0	1	1	0	0	0
1	0	0	0	1	0
1	0	1	0	0	1
1	1	0	0	0	0
1	1	1	1	1	1

c)



d) It is Mealy because output depends on both present states and input.

Question 3

a) $D_A = A \oplus X$, $D_B = (B \cdot X') \oplus (B \cdot X \cdot A') \oplus (A \cdot X \cdot B')$

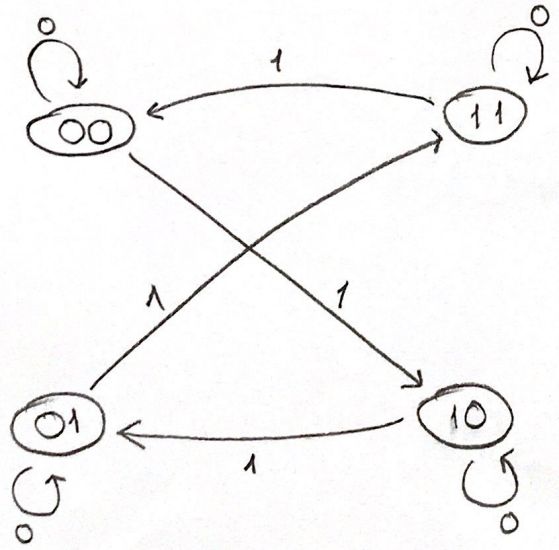
we know that $Q^+ = D$, so $A^+ = A \oplus X$

and $B^+ = (B \cdot X') \oplus (B \cdot X \cdot A') \oplus (A \cdot X \cdot B')$

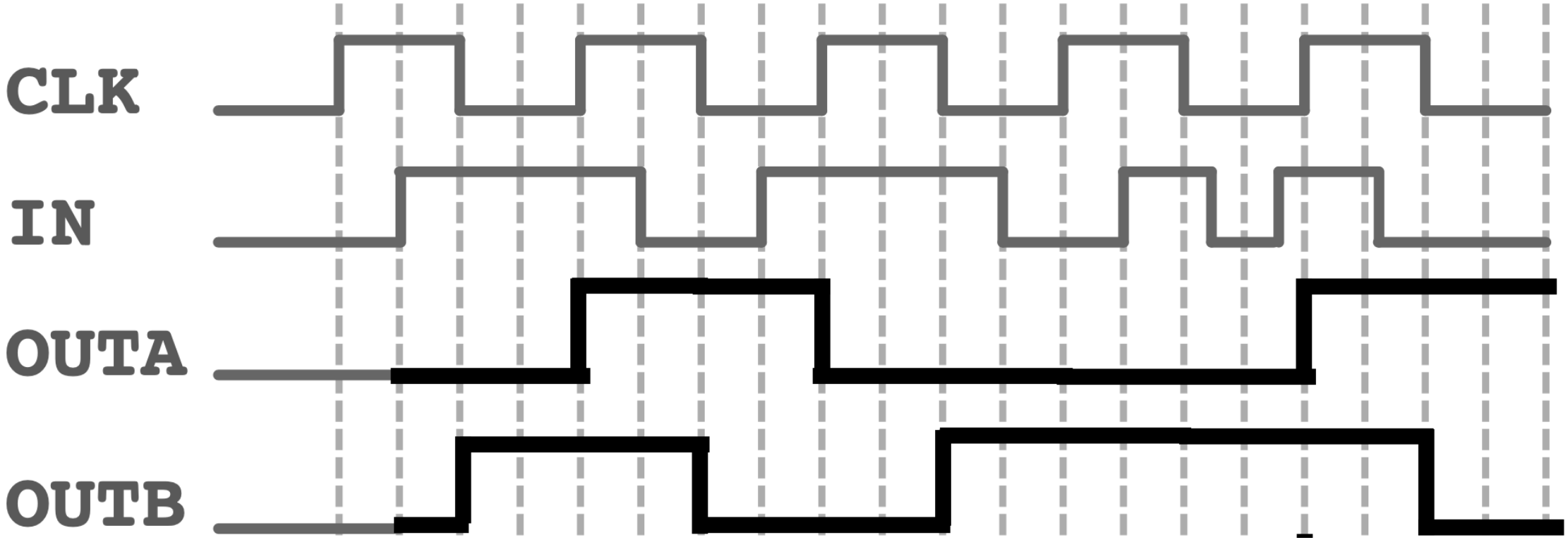
b)

Present		Input	next	
A	B	X	A^+	B^+
0	0	0	0	0
0	0	1	1	0
0	1	0	0	1
0	1	1	1	1
1	0	0	1	0
1	0	1	0	1
1	1	0	1	1
1	1	1	0	0

c)



QUESTION 4)
a)



Question 4

b)

i)

inputs		intermediate	output
G	Q	$T = G \oplus Q$	Q_0
0	0	0	0
0	1	1	0
1	0	1	1
1	1	0	1

$Q_0 = GQ' + GQ$

$\Rightarrow G(Q' + Q) = G$

, so $\boxed{Q_0 = G}$

ii)

G	Q	Q_0
0	0	0
0	1	0
1	0	1
1	1	1

QUESTION 5)