North South University

Department of Electrical & Computer Engineering

7 segment Display project CSE231

Project Report

Course name: CSE-231 (Digital Logic Design Lab)

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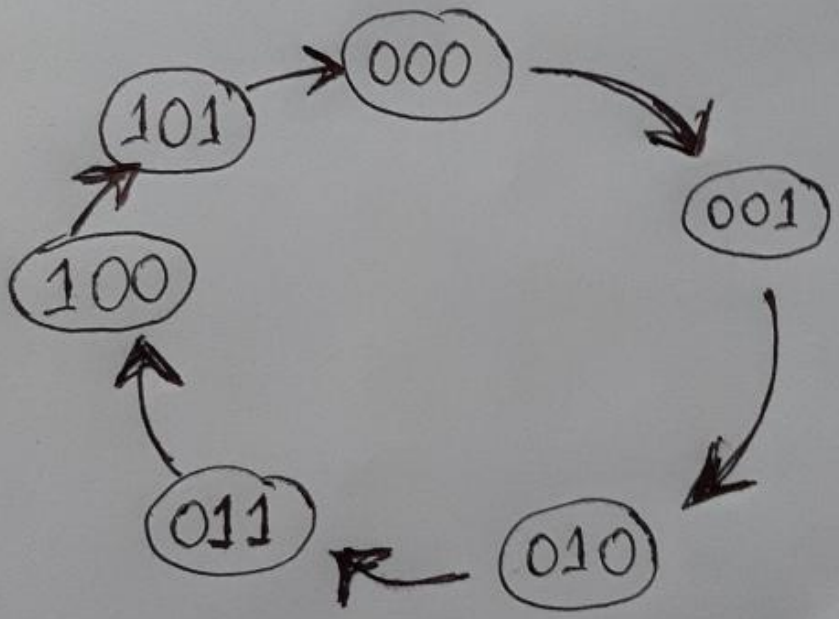
State diagram



Excitation Table

	Present State			Next State			JK flip-flop				T flip-flop			D flip-flop		
	A_t	B_t	C_t	A_{t+1}	B_{t+1}	C_{t+1}	J_A	K_A	J_B K_B	J_C K_C	T_A	T_B	T_C	D_A	D_B	D_C
0	0	0	0	0	0	1	0	×	0 ×	1 ×	0	0	1	0	0	1
1	0	0	1	0	1	0	0	×	1 ×	× 1	0	1	1	0	1	0
2	0	1	0	0	1	1	0	×	× 0	1 ×	0	0	1	0	1	1
3	0	1	1	1	0	0	1	×	× 1	× 1	1	1	1	1	0	0
4	1	0	0	1	0	1	×	0	0 ×	1 ×	0	0	1	1	0	1
5	1	0	1	0	0	0	1	0	0 ×	× 1	1	0	1	0	0	0
6	1	1	0	×	×	×	×	×	× ×	× ×	×	×	×	×	×	×
7	1	1	1	×	×	×	×	×	× ×	× ×	×	×	×	×	×	×

~~K mg~~

K map (JK flip-flop)

J_A:

A_t \ B_tC_t	00	01	11	10
0	0	0	1	0
1	X	X	X	X

$J_A = B_tC_t$

K_A:

A_t \ B_tC_t	00	01	11	10
0	X	X	X	X
1	0	1	X	X

$K_A = C_t$

J_B:

A_t \ B_tC_t	00	01	11	10
0	0	1	X	X
1	0	0	X	X

$J_B = \overline{A_t}\, C_t$

K_B:

A_t \ B_tC_t	00	01	11	10
0	X	X	1	0
1	X	X	X	X

$K_B = B_tC_t$

J_C :

A_t \ B_tC_t	00	01	11	10
0	1	X	X	1
1	1	X	X	X

$J_C = 1$

K_C :

A_t \ B_tC_t	00	01	11	10
0	X	1	1	X
1	X	1	X	X

$K_C = 1$

T flip-flop (K-map)

T_A :

A_t \ B_tC_t	00	01	11	10
0	0	0	1	0
1	0	1	X	X

$T_A = B_tC_t + A_tC_t$

T_B:

A_t \ B_tC_t	00	01	11	10
0	0	1	1	0
1	0	0	×	×

$T_B = \bar{A}_t C_t$

T_C:

A_t \ B_tC_t	00	01	11	10
0	1	1	1	1
1	1	1	×	×

$T_C = 1$

D flip-flop (K-map)

D_A:

A_t \ B_tC_t	00	01	11	10
0	0	0	1	0
1	1	0	×	×

$D_A = A_t\bar{C}_t + B_tC_t$

D_B:

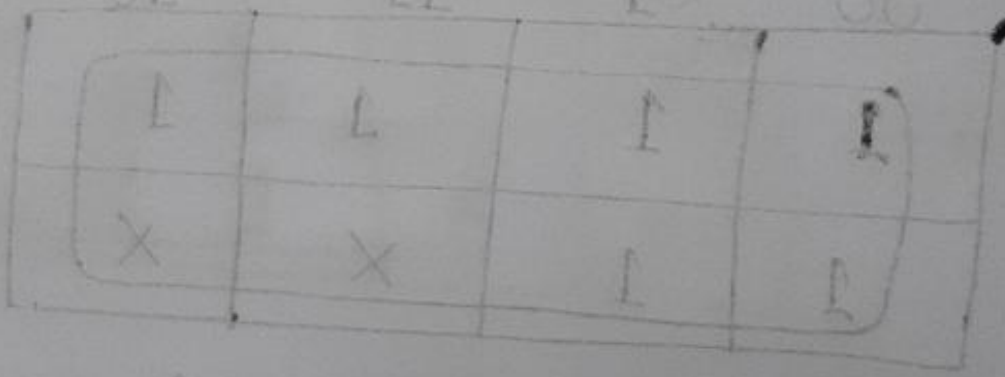
A_t \ B_tC_t	00	01	11	10
0	0	1	0	1
1	0	0	×	×

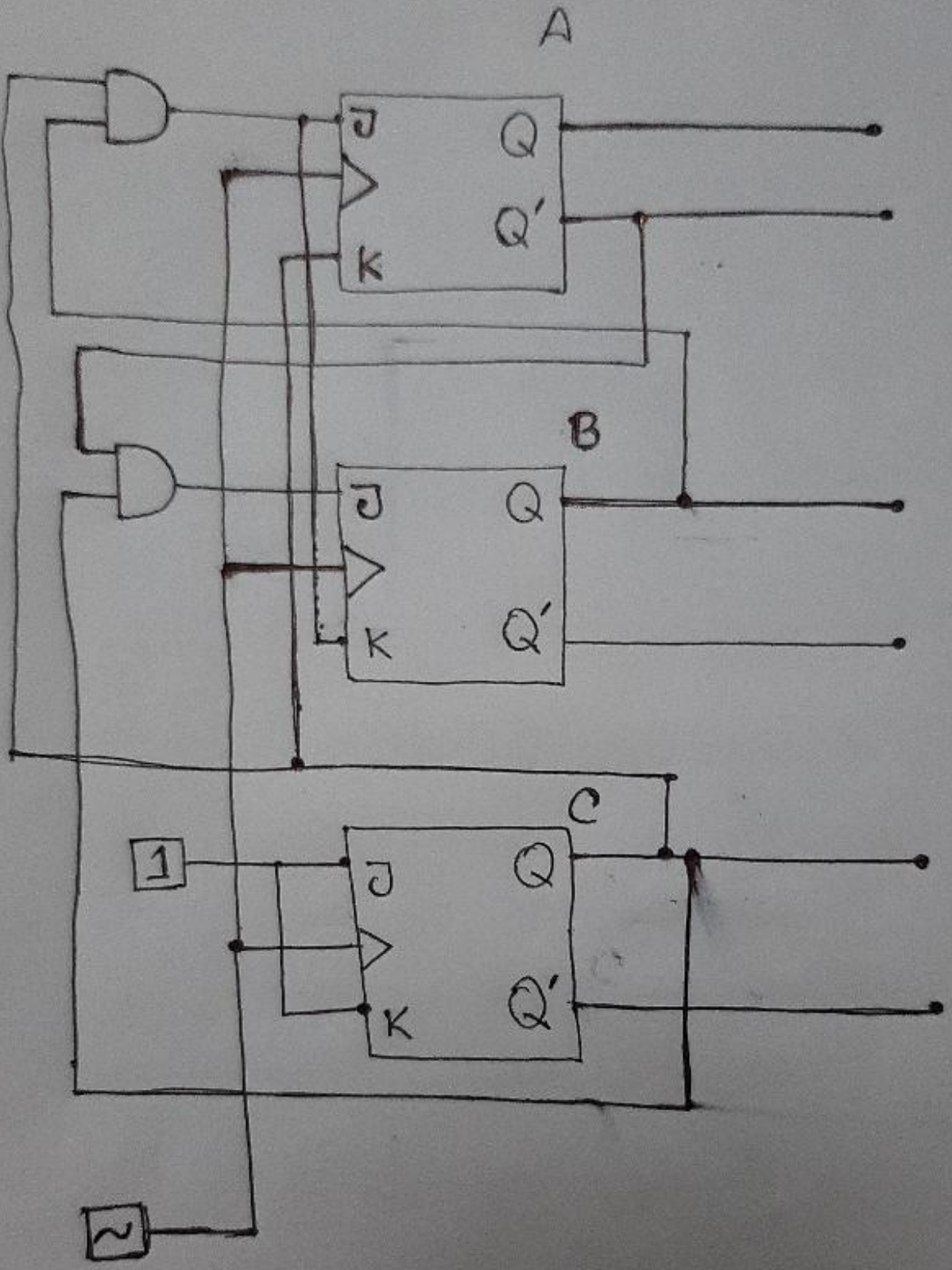
$D_B = \bar{A}_t\bar{B}_tC + B_t\bar{C}_t$

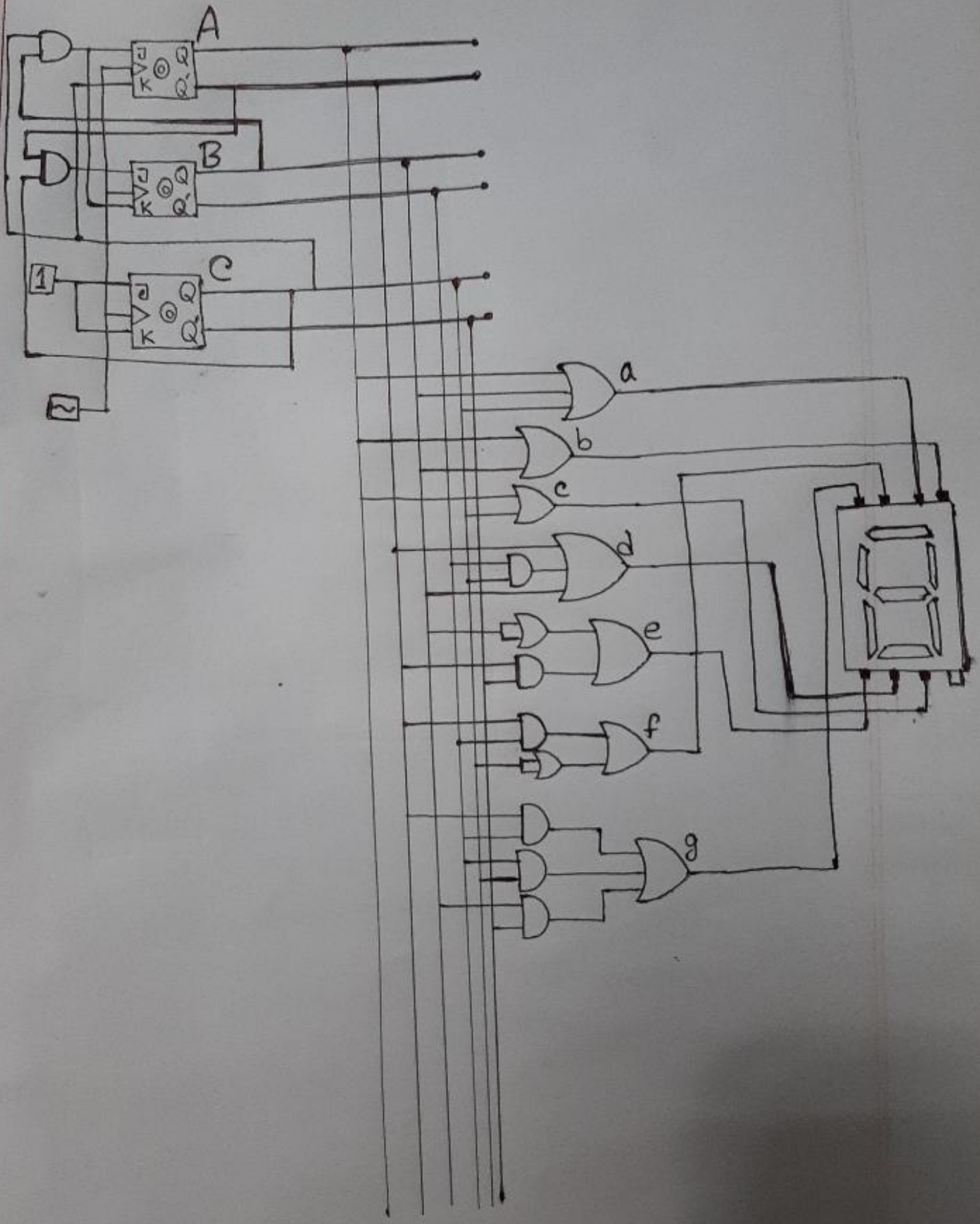
D_C :

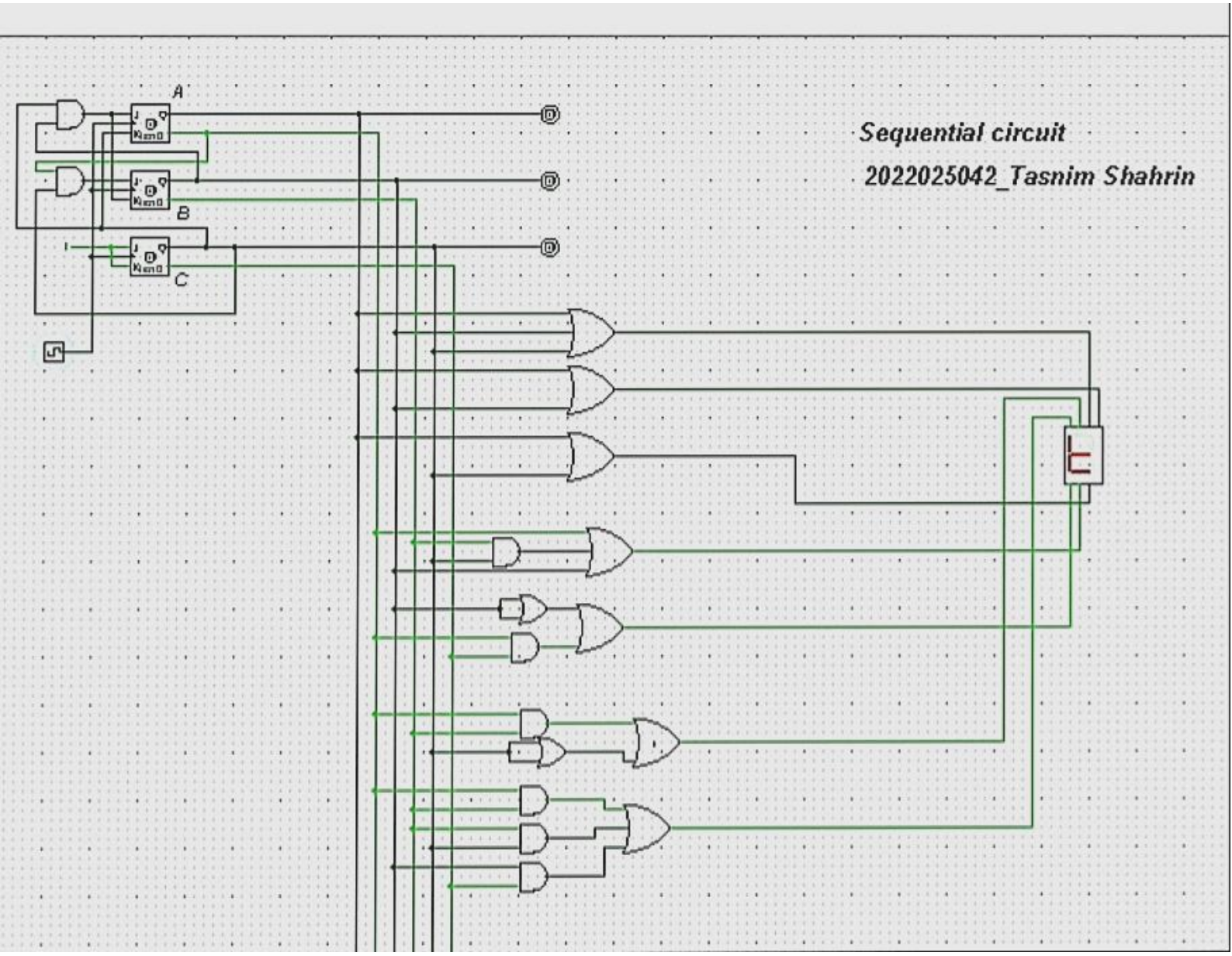
A_t \ B_tC_t	00	01	11	10
0	1	0	0	1
1	1	0	X	X

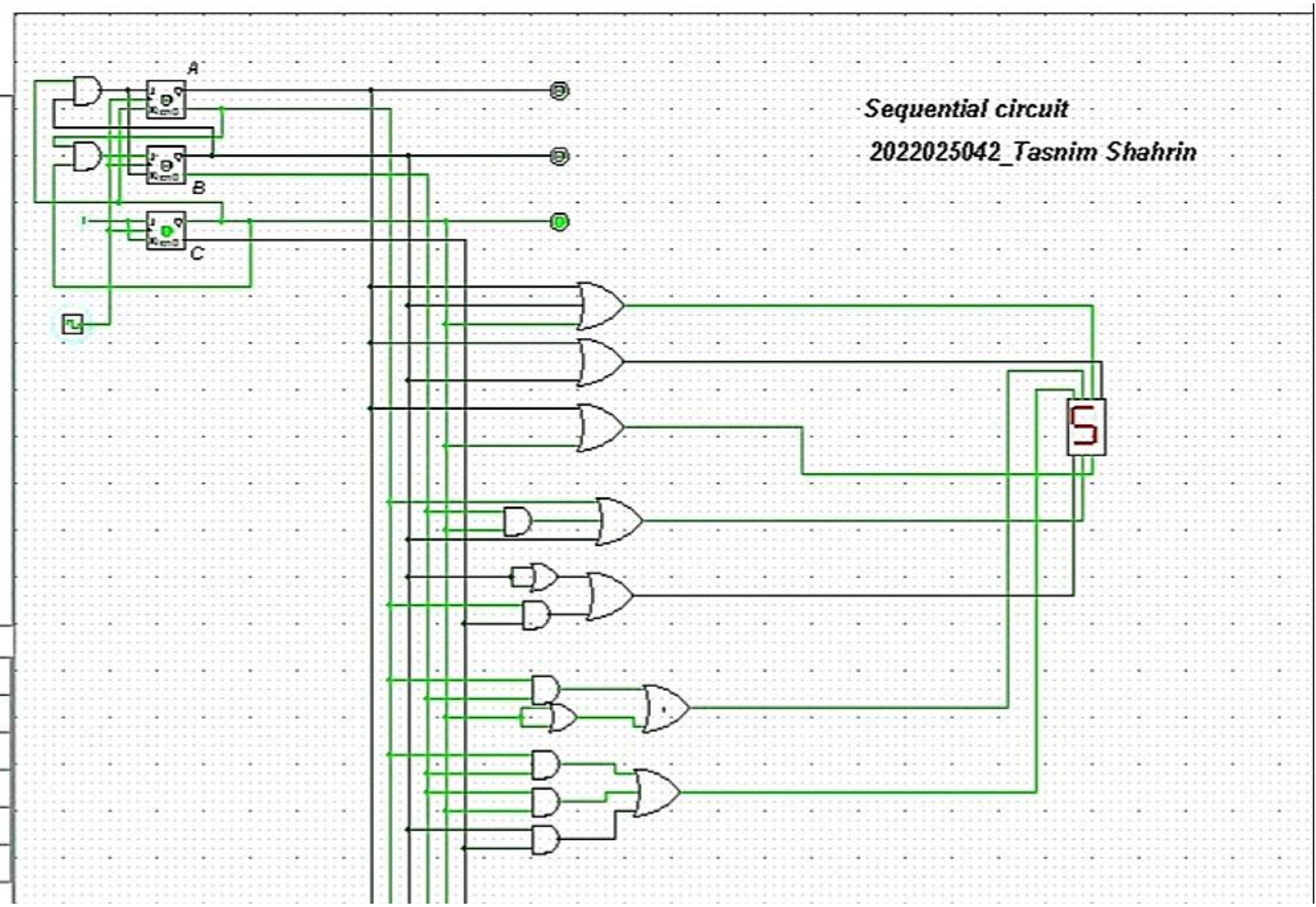
$$D_C = \overline{C_t}$$

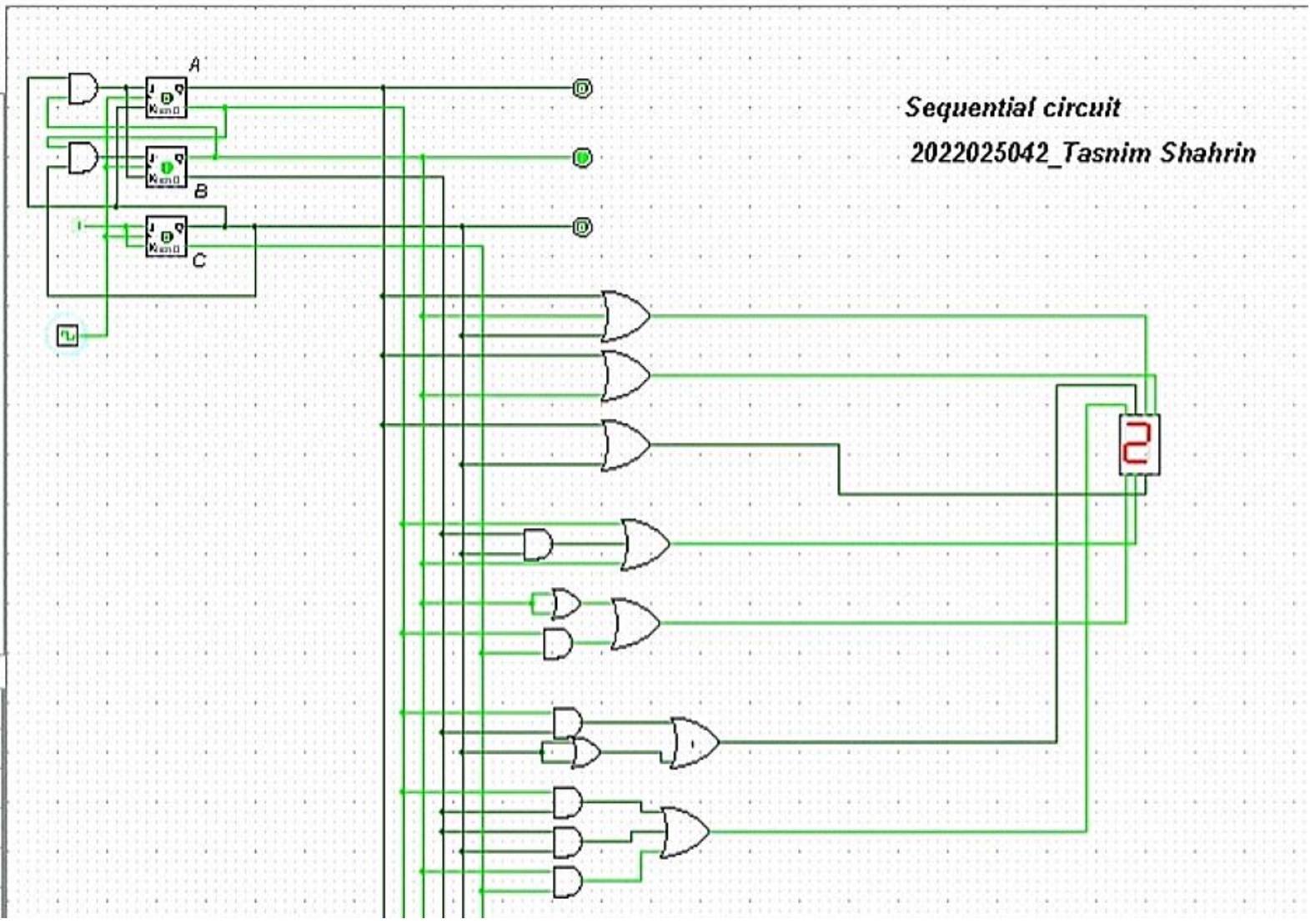


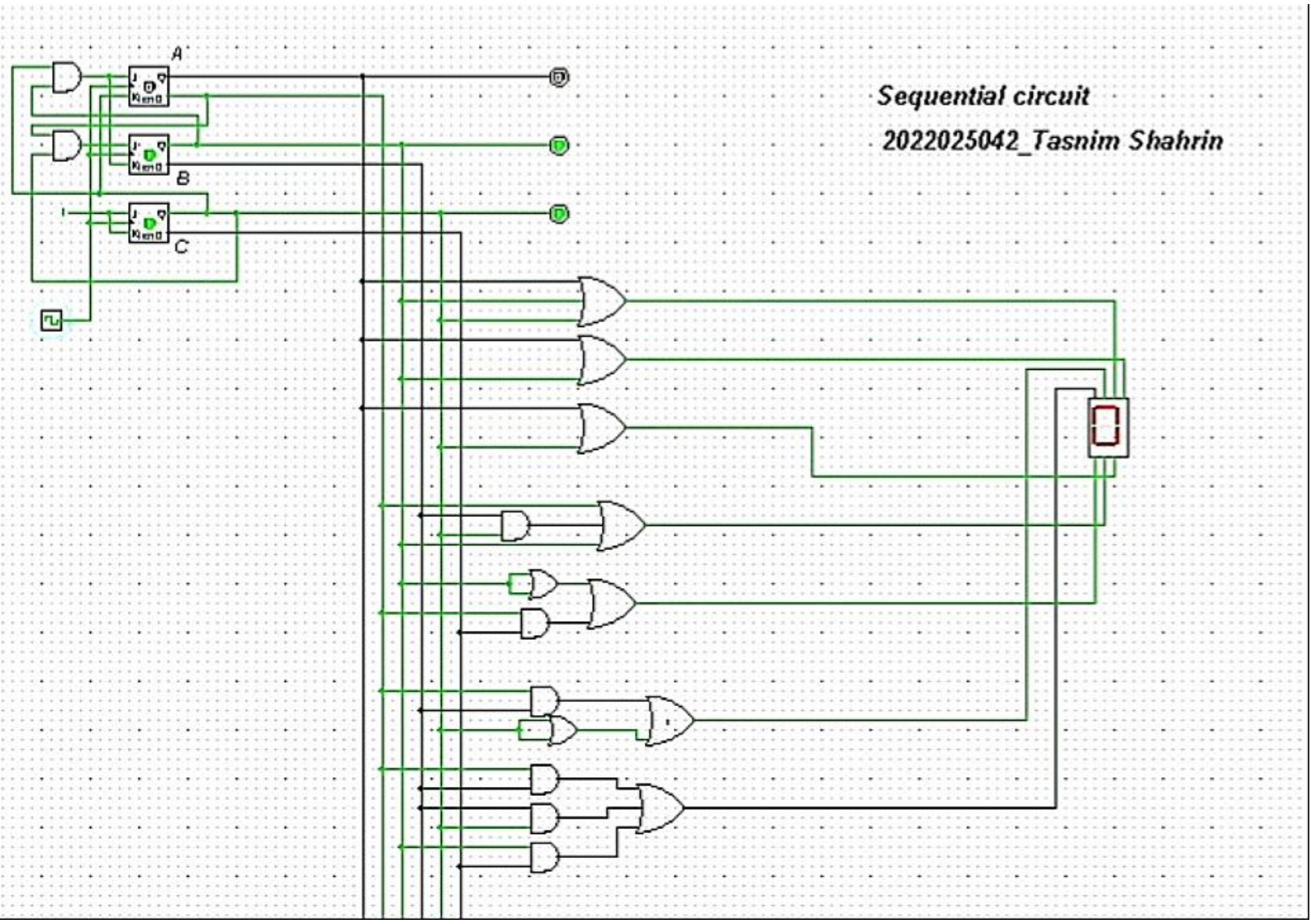

A
J
Q
Q'
K
B
J
Q
K
Q'
C
1
J
Q
K
Q'
~

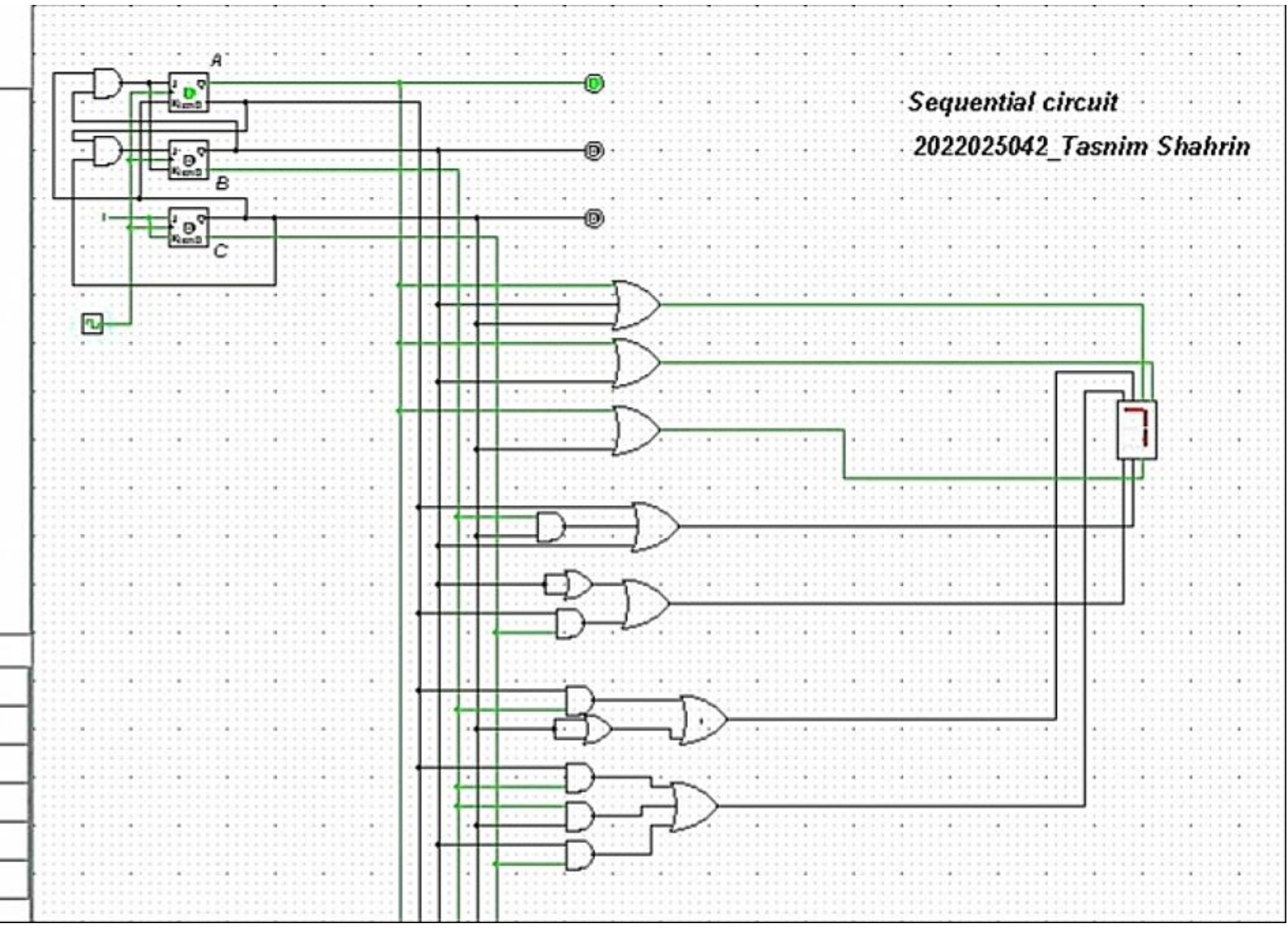

A
B
C
1
a
b
c
d
e
f
g

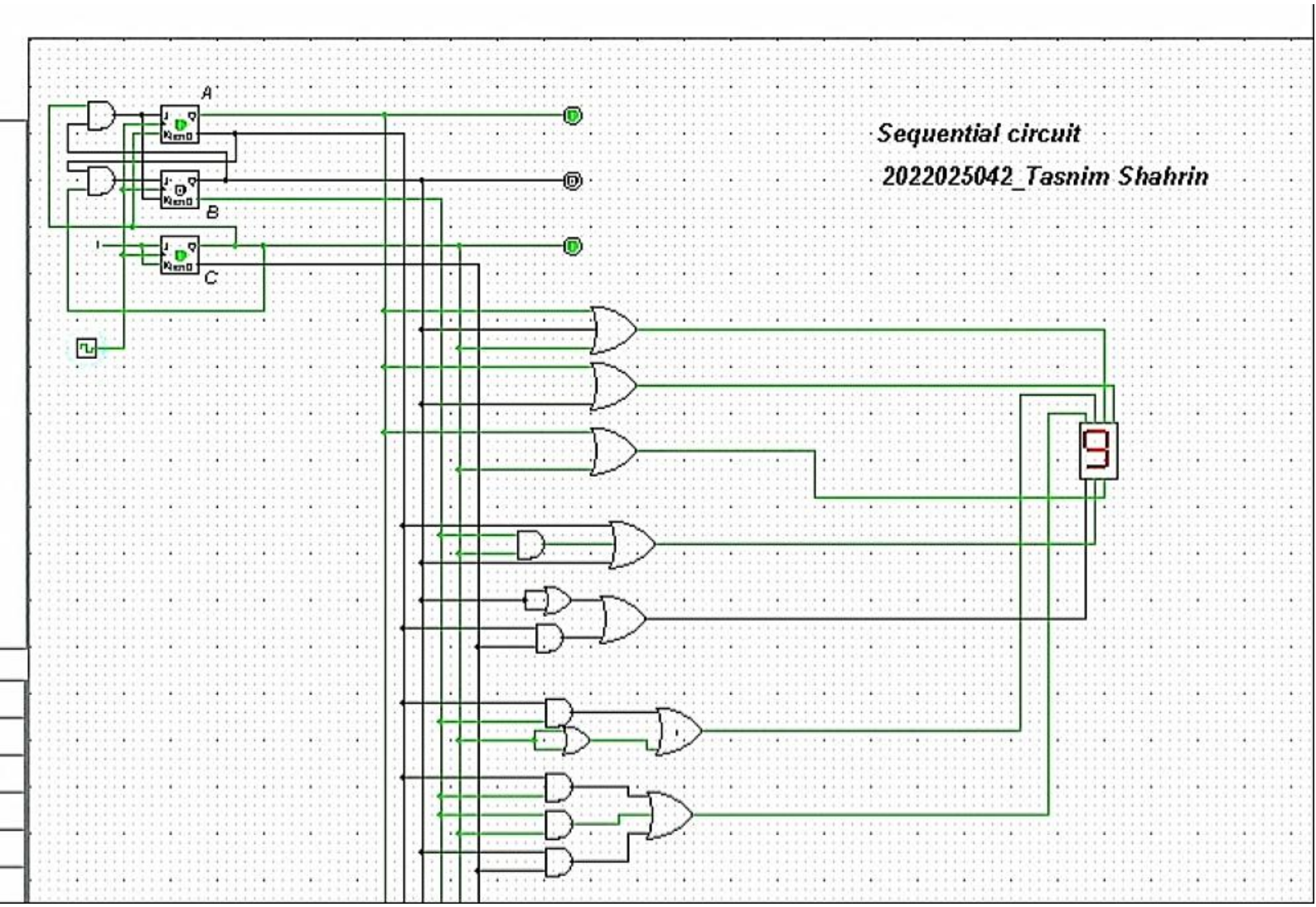

A
B
C
Sequential circuit
2022025042_Tasnim Shahrin


Sequential circuit
2022025042_Tasnim Shahrin
A
B
C
5


A
B
C
Sequential circuit
2022025042_Tasnim Shahrin


A
B
C
Sequential circuit
2022025042_Tasnim Shahrin


A
B
C
Sequential circuit
2022025042_Tasnim Shahrin


Sequential circuit
2022025042_Tasnim Shahrin
A
B
C

Cost analysis

Sequential circuit with combinational circuit :

Equipment list :

Component name	Quantity	Rate	Amount
Bread board	2	90/=	180/=
Wires	60	2/=	120/=
Dual JK flip-flop	3	20·9/=	62·7/=
7 Segment Display	1	~~22·67/=~~ 9·85/=	~~22·67/=~~ 9·85/=
IC 4075 (3 in OR)	1	22·67/=	22·67/=
IC 7432 (2 in OR)	2	27·59/=	55·18/=
IC 7408 (2 in AND	2	23·59/=	47·18/=
IC 7404 (Hex Inverter NOT)	1	25·59/=	25·59/=
1N 4148 High Speed Switch	1	1·9/=	1·9/=

Total = 525·07/=

Discussion:

In this project ~~we~~ I made 7-segment display to display "tS2079".

At first ~~we~~ I made the truth table. By using the truth table ~~we~~ I got SOP and POS equations. I draw the circuits of SOP and POS in the generialized and simplified from.

I also did K-maps for SOP and POS. By the K-maps we got the simplified form. The simplifie form ~~is~~ made the circuit quite simple and short.

After ~~that~~ ~~we~~ I use the 3 to 8 line decoder, and 4:1 MUX. and use the same truth table to display 7-segment "tS2079".

I also draw and simulate the simplification form of SOP and POS by using NAND and NOR gates.

I draw and simulate the sequential circuit with combinational circuit. I use JK flip-flop to make the input automated.

Typically for a standard red colored 7-segment display, Each LED segment can draw about 15 mA to illuminated connectly, So on a 5V digital logic circuit, the value of the current limiting register would be about 200Ω(5V-2V)/15 or 220 Ω to the nearest higher preffered value. So, to understand how the segments of the display are connected to a 220Ω current limiting register considers the circuit below.

Conclusion:

This project was good opportunity for all of us to learn how the system works and learn the theory as well. We also faced a lot of problems which taught us what kind to problems can be faced while building a 7-segment display. We had problems mostly with lack of knowledge on how to build everything but with a great deal of time spent on it together we figured it out eventually.