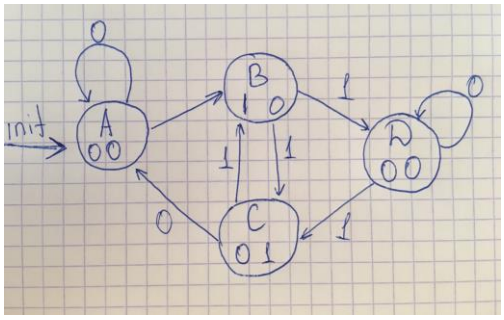
Digital Circuits Laboratory report	**Year 2020** **Number of the exercise: 2**
1. Name and surname (author of realized circuit/this report): Nykonchuk Illia CAD[1]	**Title of the exercise: Synthesis of synchronous circuit**
Laboratory group number: Breadboard number:	Week day: Thursday Hours of the lab:17:05-18:45

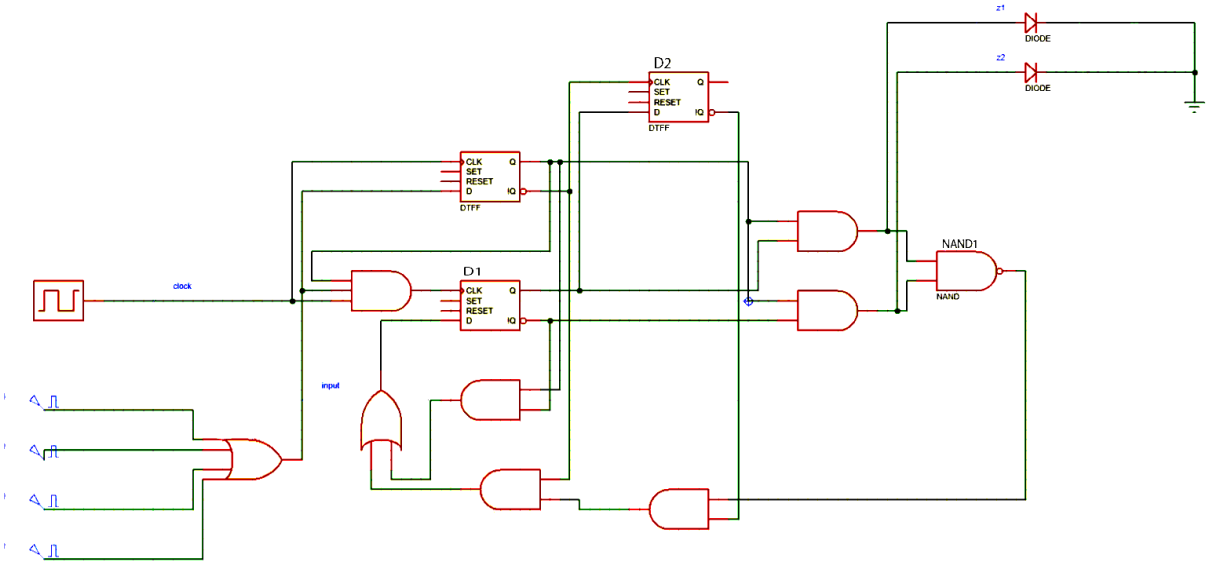
Moore machine

Moore machine is a finite-state machine whose output values are determined only by its current state.

States-outputs graph

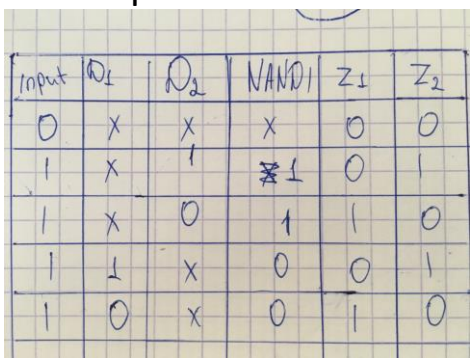


a) Logic Circuit



Remark: D2 stores last even value, D1 responsible for output and it resets by the data from output or from D2

b) Minimization of states-outputs table



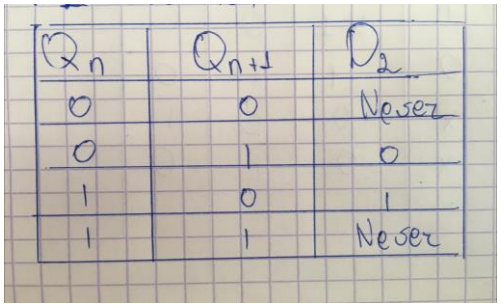
Input	Q_1	Q_2	NAND1	Z_1	Z_2
0	x	x	x	0	0
1	x	1	~~x~~ 1	0	1
1	x	0	1	1	0
1	1	x	0	0	1
1	0	x	0	1	0

Coding of states:

A: D1(Q)=0, NAND1 = 1
B: D1(Q)=1, NAND1 = 0
C: D1(Q)=0, NAND1 = 0
D: D1(Q)=1, NAND1 = 1

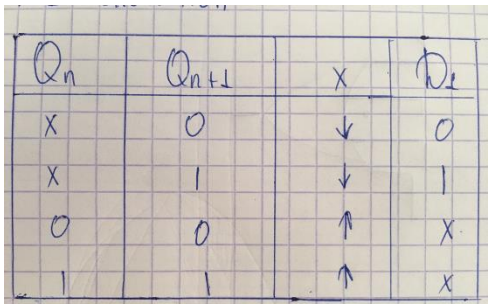
c) Excitation tables:

D1



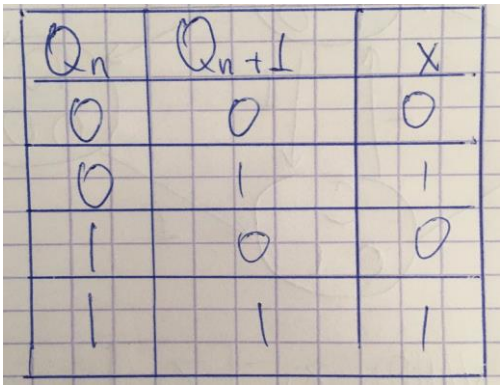
Q_n	Q_{n+1}	D_2
0	0	Never
0	1	0
1	0	1
1	1	Never

D2



Q_n	Q_{n+1}	x	D_2
x	0	↓	0
x	1	↓	1
0	0	↑	x
1	1	↑	x

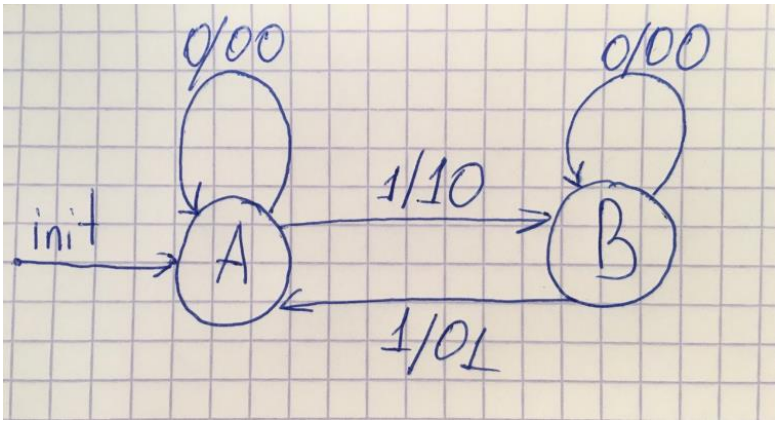
D3



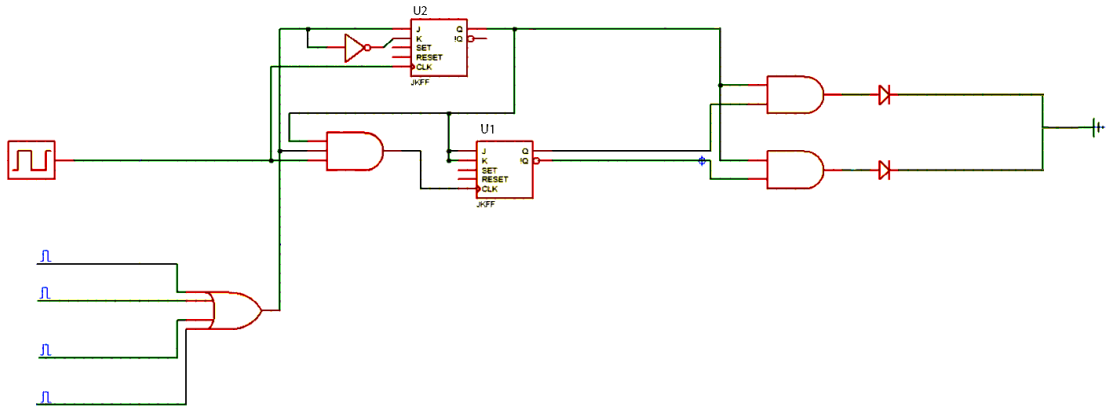
Q_n	Q_{n+1}	X
0	0	0
0	1	1
1	0	0
1	1	1

Mealy Machines are also finite state machines with output value and its output depends on present state and current input symbol

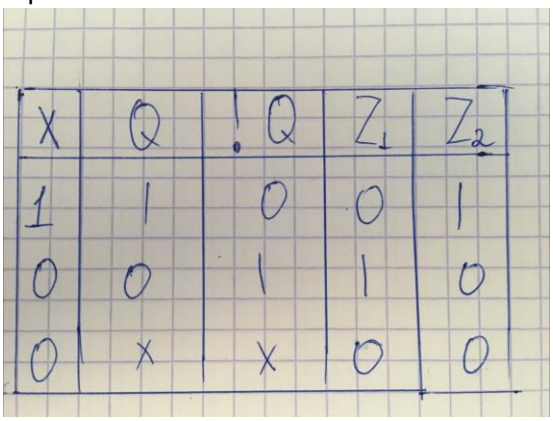
States-outputs graph:



Logic circuit



Minimized states-outputs table

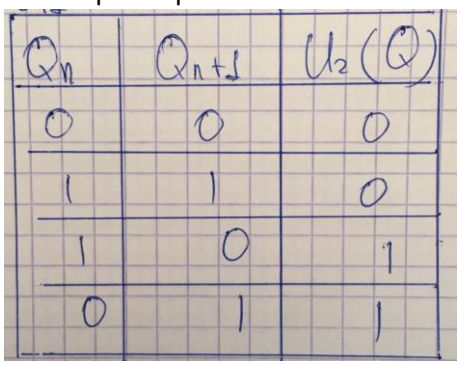


X	Q	!Q	Z_1	Z_2
1	1	0	0	1
0	0	1	1	0
0	x	x	0	0

Coding of states:
A: U1(Q)=1, U1(!Q)=0;
B: U1(Q)=1, U1(!Q)=1;

Excitation tables: (U1 and U2 are on the circuit)

U1 flip-flop

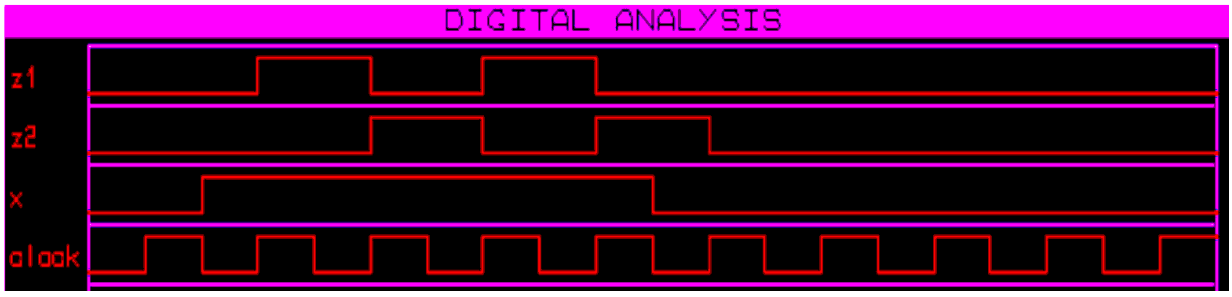


Q_n	Q_{n+1}	$U_2(Q)$
0	0	0
1	1	0
1	0	1
0	1	1

U2 flip-flop

Q_n	Q_{n+1}	X
X	1	1
X	0	0

Time diagram for sequence 1111000000



Time diagram for sequence 0000001111