Lab 2
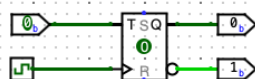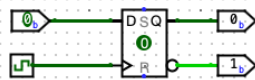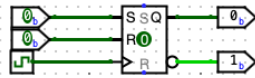
Problem 1.

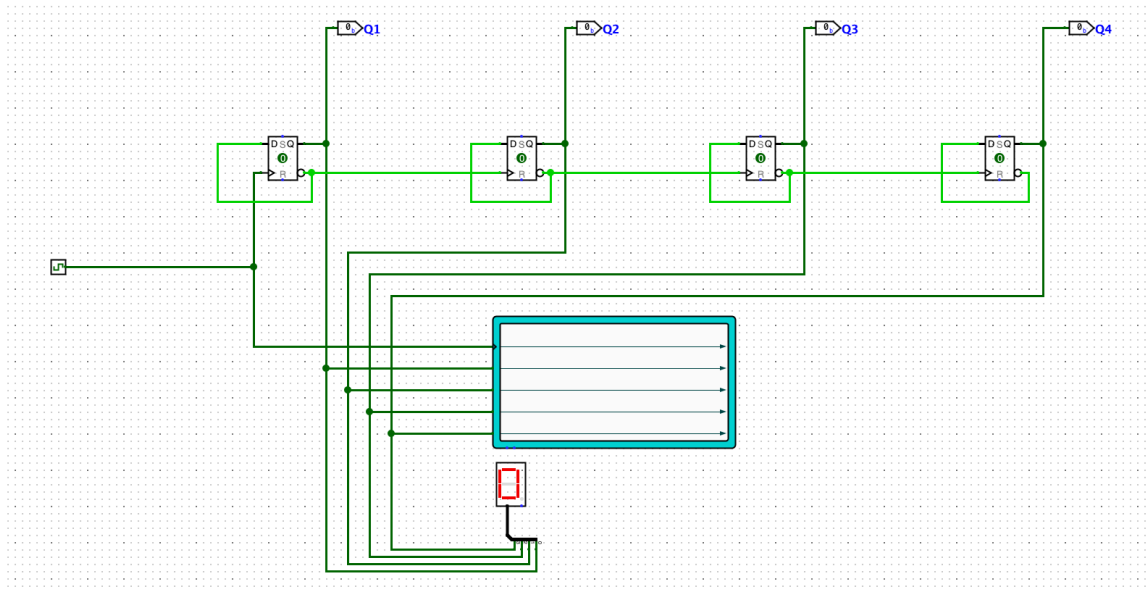| Ck	S	R	Q	~Q	
0	x	x	Q	~Q	No Change
1	0	0	Q	~Q	No Change
1	0	1	0	1	Reset -> 0
1	1	0	1	0	Set -> 1
1	1	1	1	1	Undefined

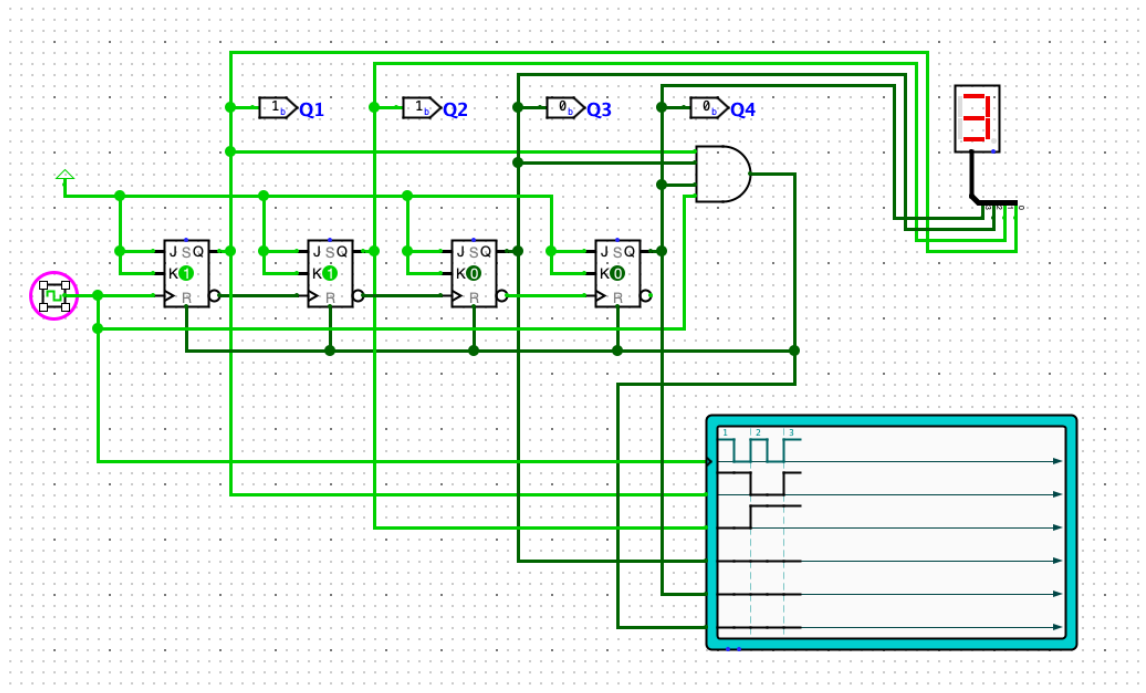| Ck	S	R	Q	~Q	
0	x	x	Q	~Q	No Change
1	0	0	Q	~Q	No Change
1	0	1	0	1	Reset -> 0
1	1	0	1	0	Set -> 1
1	1	1	~Q	Q	Toggle

Ck	T	Q	~Q	
0	x	Q	~Q	No Change
1	0	Q	~Q	No Change
1	1	~Q	Q	Toggle

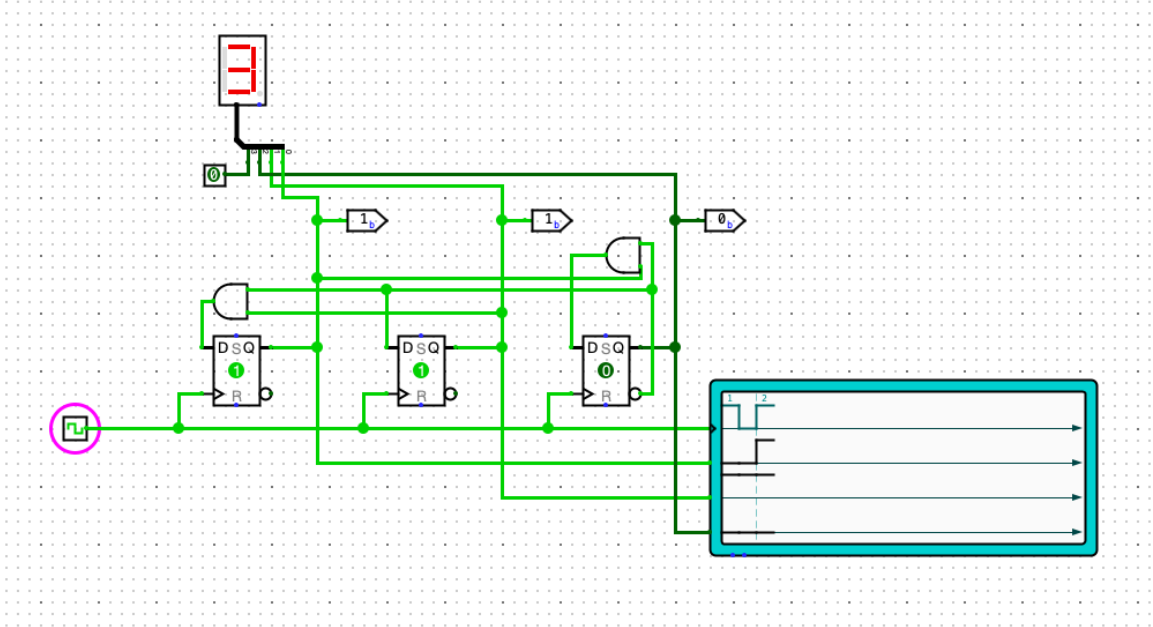| Ck	T	Q	~Q	
0	x	Q	~Q	No Change
1	0	Q	~Q	Reset
1	1	~Q	Q	Set

Problem 2.

We can use NOT Q from D-FF and the clock input of the D-FF to build up a counter.

Problem 3.

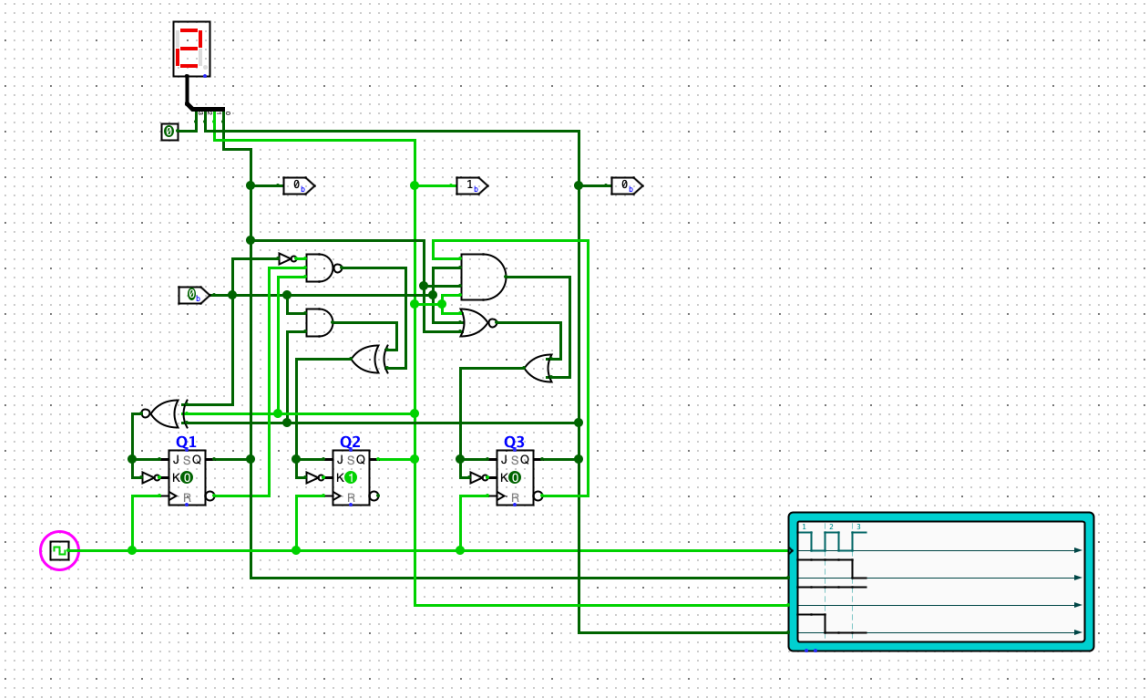JK-FF can work as T-FF when we connect both J and K inputs together.

Problem 4.

$q_1 = \neg q_2 \wedge q_2$
$q_2 = \neg q_3$
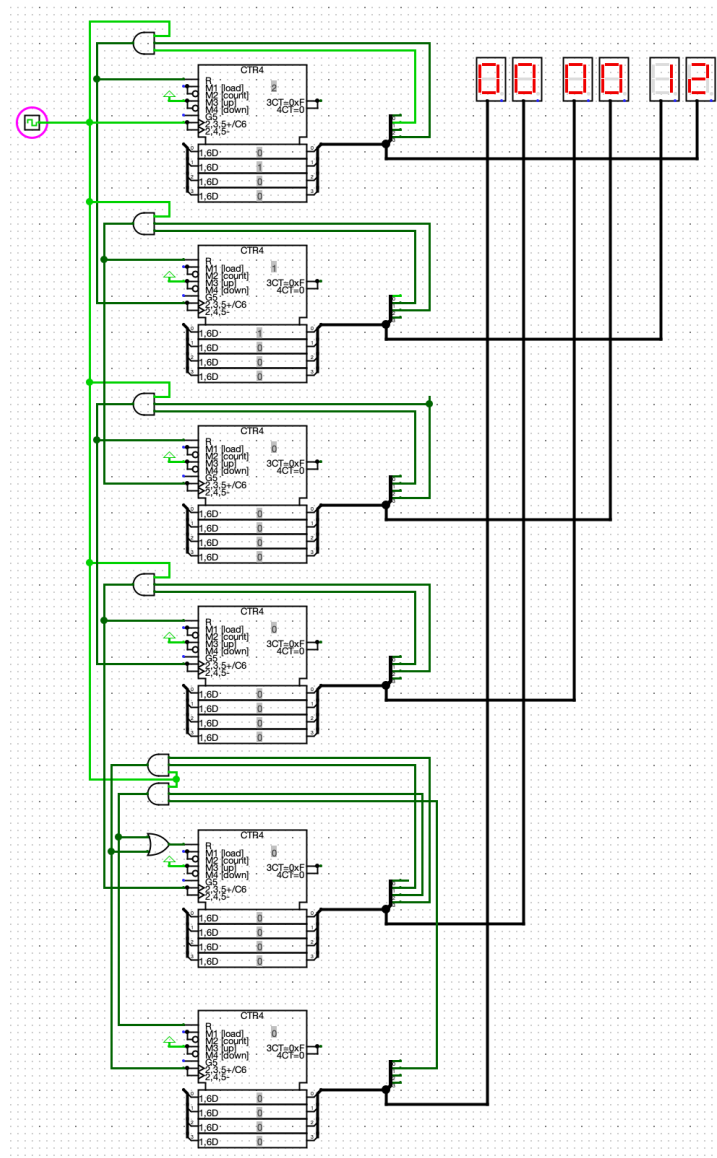$q_3 = \neg q_3 \wedge q_1$

Present State			Next State		
q1	q2	q3	Q1	Q2	Q3
0	0	0	0	1	0
0	1	0	1	1	0
1	1	0	1	1	1
1	1	1	0	0	0

Problem 5.

Present State			Next State					
			x = 0			x = 1		
q1	q2	q3	Q1	Q2	Q3	Q1	Q2	Q3
0	0	0	1	1	1	0	1	0
0	1	0	0	0	0	1	1	0
1	1	0	0	1	0	1	1	1
1	1	1	1	1	0	0	0	0

Problem 6.

To create a counting clock using counters, we require a total of 6 counters. Each counter corresponds to one digit of the clock's 6-digit display. These counters are linked sequentially, so when one counter resets, it triggers the increment of the next counter. For instance, in the minute part of the clock, we need 2 counters. The first one counts from 0 to 9, and upon reaching 10, it resets to 0 and triggers an increment in the second counter, which counts from 0 to 5. Once the second counter reaches 60, it resets and advances the first counter of the minute part by 1, and the cycle continues.