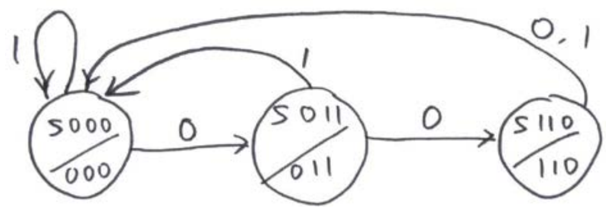
Recitation #10 Solutions

1. a. State diagram:



b. State assignment:

State	q1	q0
S000	0	0
S011	0	1
S110	1	0

State table:

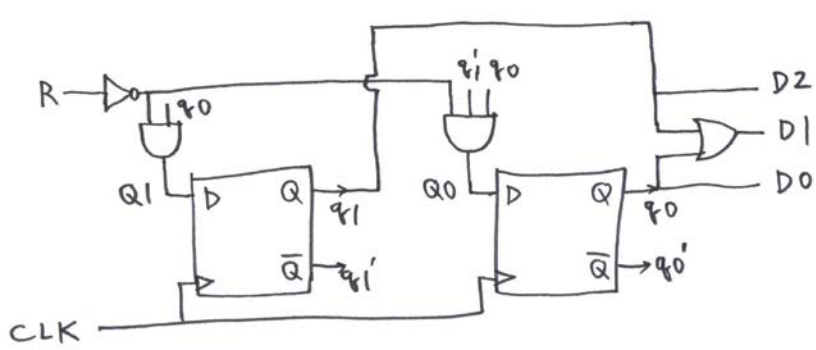
R	q1	q0	Q1	Q0
0	0	0	0	1
0	0	1	1	0
0	1	0	0	0
0	1	1	d	d
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	d	d

Output table:

q1	q0	D2	D1	D0
0	0	0	0	0
0	1	0	1	1
1	0	1	1	0
1	1	d	d	d

c. Q1 = R’.q0
Q0 = R’.q1’.q0
D2 = q1
D1 = q1+q0
D0 = q0

Sequence circuit:



2. We design a Moore machine with 4 states:

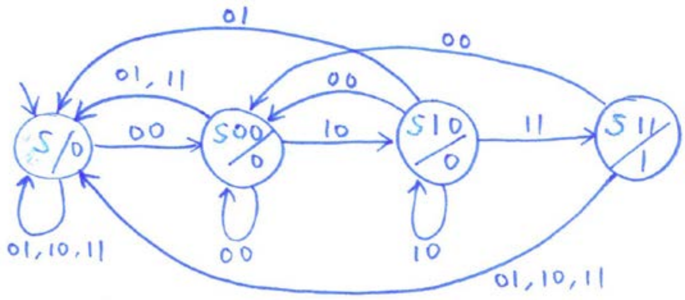
    S – Before the lock enters a state in which both S_1 and S_2 are open.

    S00 – Both S_1 and S_2 are open.

    S10 – S_1 is closed while S_2 is open.

    S11 – Both S_1 and S_2 are closed.

    State diagram (the label on each transition is "S_1S_2"):



Assume the following state assignment: S → 01, S00 → 00, S10 → 10, S11 → 11.

State table:

q1	q0	S_1	S_2	Q1	Q0
0	0	0	0	0	0
0	0	0	1	0	1
0	0	1	0	1	0
0	0	1	1	0	1
0	1	0	0	0	0
0	1	0	1	0	1
0	1	1	0	0	1
0	1	1	1	0	1
1	0	0	0	0	0
1	0	0	1	0	1
1	0	1	0	1	0
1	0	1	1	1	1
1	1	0	0	0	0
1	1	0	1	0	1
1	1	1	0	0	1
1	1	1	1	0	1

$Q1 = q1.q0'.S_1 + q0'.S_1.S_2'$

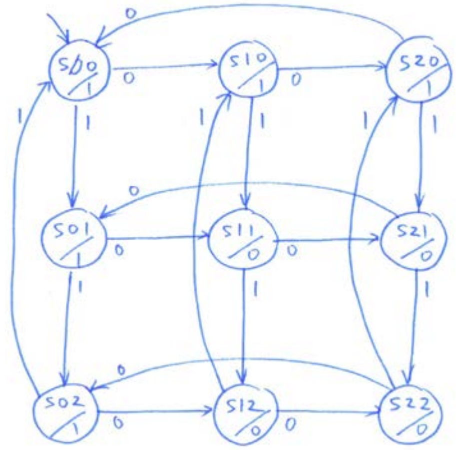
$Q0 = S_2 + q0.S_1$

Output table:

q1	q0	Z
0	0	0
0	1	0
1	0	0
1	1	1

$Z = q1.q0$

3. Nine states are required. Each state is named SXY such that X is the remainder when number of 0's is divided by 3 and Y is the remainder when number of 1's is divided by 3. The state diagram:



4. We design a Moore machine with 4 states. The output will be the same as the state. The state table is as follows:

S	Q1	Q0	q1	q0	J1	K1	J0	K0
0	0	0	0	1	0	d	1	d
0	0	1	1	0	1	d	d	1
0	1	0	1	1	d	0	1	d
0	1	1	0	0	d	1	d	1
1	0	0	1	1	1	d	1	d
1	0	1	0	0	0	d	d	1
1	1	0	0	1	d	1	1	d
1	1	1	1	0	d	0	d	1

J1=K1=S⊕Q0, J0=K0=1