Q1.

a. out = !(A&B) | (C | !(B & C))

A	B	C	out
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

b. On Logisim

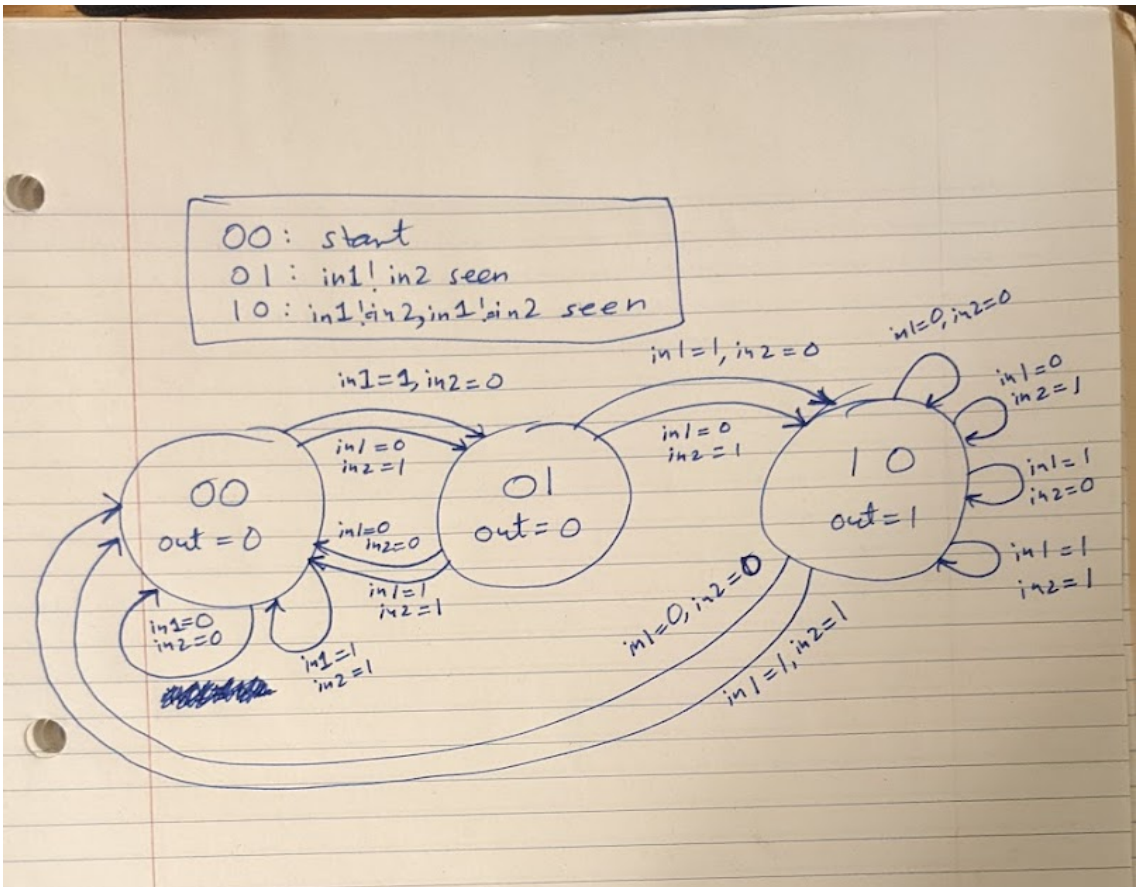
c. out1 = !A!BC + !AB!C + !ABC + A!BC + AB!C
out2 = !AB!C + AB!C

d. On Logisim

Q2. On Logisim.

Q3.

a.



b.

Q1	Q0	out	in1	in2	D1	D0
0	0	0	0	0	0	0
0	0	0	0	1	0	1
0	0	0	1	0	0	1
0	0	0	1	1	0	0
0	1	0	0	0	0	0
0	1	0	0	1	1	0
0	1	0	1	0	1	0
0	1	0	1	1	0	0
1	0	1	anything	anything	1	0

States:
00: start
01: in1 != in2 seen
10: in1 != in2, in1 != in2 seen

c. out = Q1•!Q0
D1 = !Q1•Q0•!in1•in2 + !Q1•Q0•in1•!in2 + Q1•!Q0
D0 = !Q1•!Q0•!in1•in2 + !Q1•!Q0•in1•!in2

Circuit made in Logisim.