7/10

Dan Ports
6.111 PS3

1. a. ✓ $D_0 = \overline{Q_1}\, X + Q_0 \overline{X}$

$D_1 = Q_0 Q_1 X + Q_0 \overline{Q_1} + \overline{X}\,\overline{Q_1} + Q_0 \overline{X}$

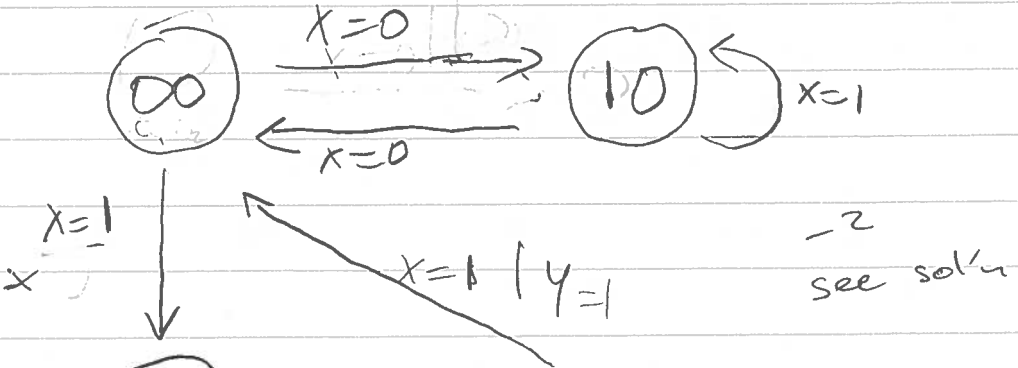
$Y = \overline{(Q_0 \oplus Q_1)}\, X$

b

X	Q_0	Q_1	LSB Q_0	MSB Q_1	Y
0	0	0	0	1	0
0	0	1	0	0	0
0	1	0	1	1	0
0	1	1	1	1	0
1	0	0	1	0	0
1	0	1	0	1	0
1	1	0	1	1	1
1	1	1	0	0	1

x -1

c



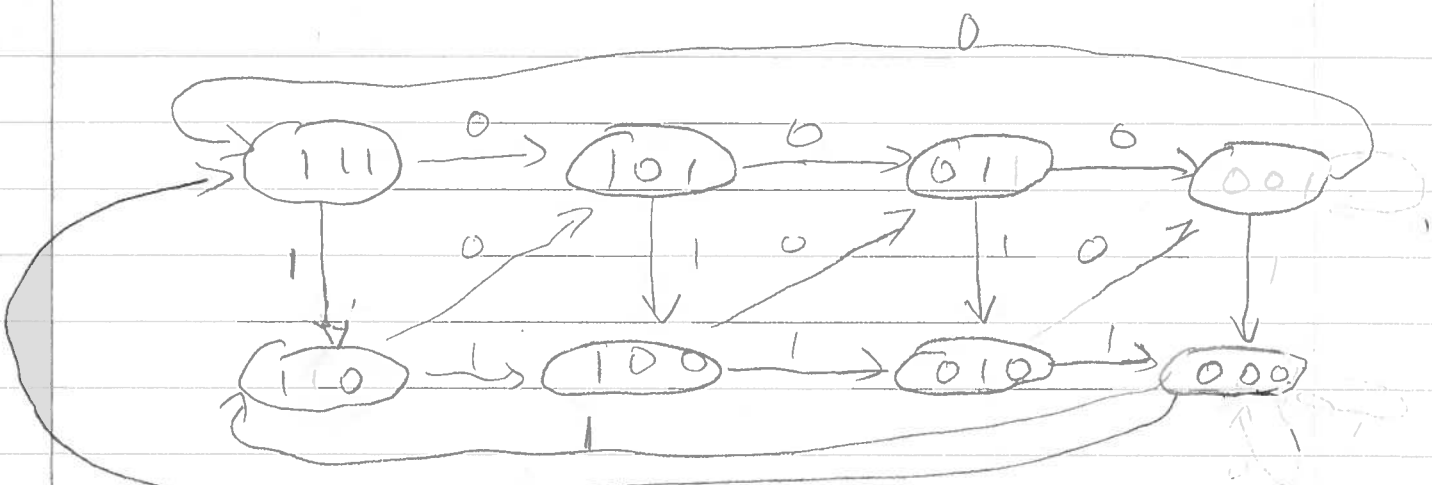
-2
see sol'n

d. This is a Mealy machine because the outputs are a function of the input as well as the state. A Moore machine may require more states than an equivalent Mealy machine. However, Mealy machines may be susceptible to more glitches due to the output dependence on asynchronous inputs.

MSB LSB

2 ÷5

E/0	Q_2	Q_1	Q_0	Q_2	Q_1	Q_0
0	0	0	0	1	1	1
0	0	0	1	1	1	1
0	0	1	0	0	0	1
0	0	1	1	0	0	1
0	1	0	0	0	1	1
0	1	0	1	0	1	1
0	1	1	0	1	0	1
0	1	1	1	1	0	1
1	0	0	0	1	1	0
1	0	0	1	0	0	0
1	0	1	0	0	0	0
1	0	1	1	0	1	0
1	1	0	0	0	1	0
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	1	1	1	0



Q_0

Q_2Q_1 \ Q_0E	00	01	11	10
00	1	0	0	1
01	1	0	0	1
11	1	0	0	1
10	1	0	0	1

$$Q_0 = \overline{E}$$

Q_1

Q_2Q_1 \ Q_0E	00	01	11	10
00	1	1	0	1
01	0	0	1	0
11	0	0	1	0
10	1	1	0	1

$$Q_1 = \overline{Q}_1\overline{Q}_0 + \overline{Q}_1\overline{E} + Q_1Q_0E$$

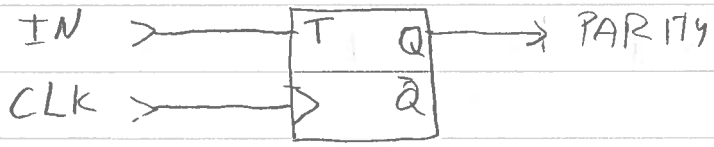
Q_2

Q_2Q_1 \ Q_0E	00	01	11	10
00	1	1	0	1
01	0	0	0	0
11	1	1	1	1
10	0	0	1	0

$$Q_2 = Q_2Q_1 + \overline{Q}_2\overline{Q}_1\overline{E} + \overline{Q}_2Q_1Q_0 + Q_2Q_0E$$

A circuit diagram for the evenlodd counter is attached.

The parity counter is trivial to implement using a T flipflop.



6.111 PS3 - 2
Dan Ports
Even/Odd Counter