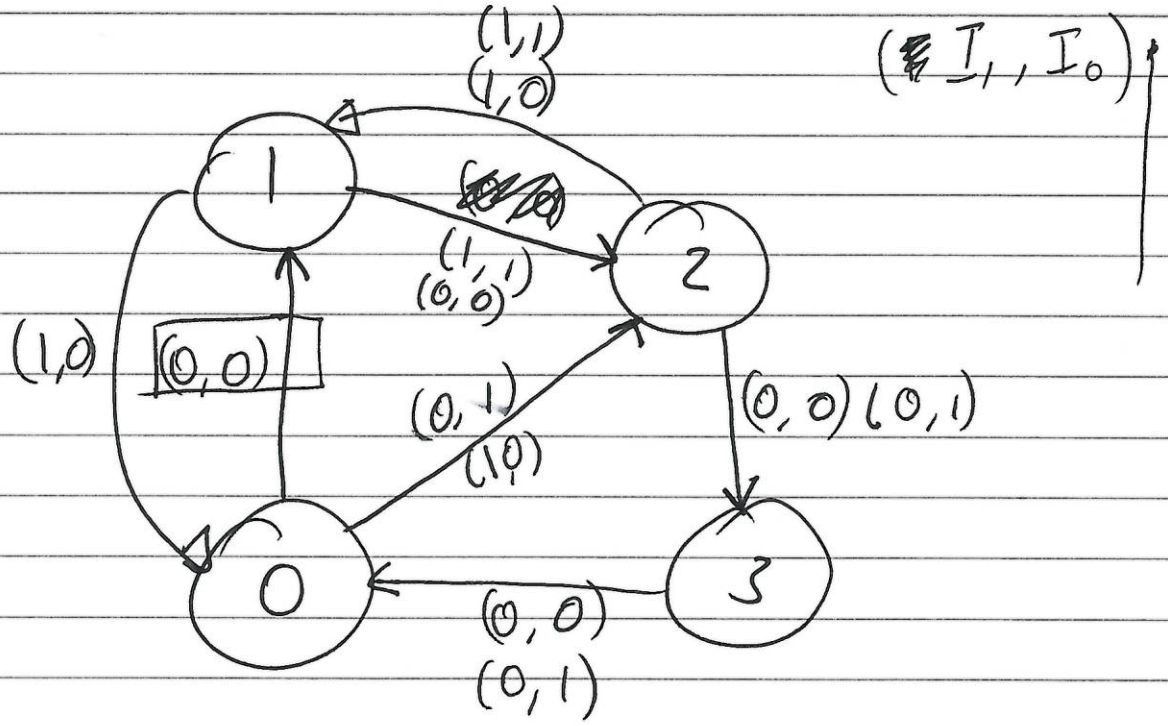
Hardware 2014 - Q2

2)a)



b)

I_1	I_0	This state	Q_1	Q_0	Next State	D_1	D_0
0	0	0	0	0	1	0	1
0	0	1	0	1	2	1	0
0	0	2	1	0	3	1	1
0	0	3	1	1	0	0	0
0	1	0	0	0	2	1	0
0	1	X	0	1	X	X	X
0	1	2	1	0	3	1	1
0	1	3	1	1	0	0	0
1	0	0	0	0	2	1	0
1	0	1	0	1	0	0	0
1	0	2	1	0	1	0	1
1	0	X	1	1	X	X	X
1	1	X	0	0	X	X	X
1	1	1	0	1	2	1	0
1	1	2	1	0	1	0	1
1	1	X	1	1	X	X	X

c) Karnaugh Map for D_1

$I_1 I_0$ \ $Q_1 Q_0$	00	01	11	10
00	0	1	0	1
01	1	1X	0	1
11	X 1	1	X 0	0
10	1	0	X 0	0

for Q_2.

Kmap for D_0

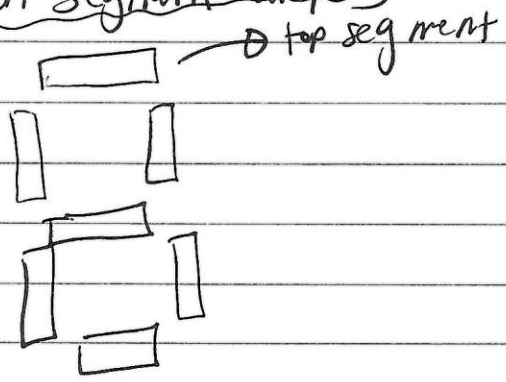
$I_1 I_0$ \ $Q_1 Q_0$	00	01	11	10
00	1	0	0	1
01	0	X_0	0	1
11	X_0	0	X_0	1
10	0	0	X_0	1

$$D_1 = I_1' \cdot I_0' \cdot Q_1' \cdot Q_0 + I_0 \cdot Q_1 + I_1 \cdot I_0' \cdot Q_1' \cdot Q_0' + I_1 \cdot Q_1 \cdot Q_0'$$

$$D_2 = I_1' \cdot I_0' \cdot Q_0' + Q_1 \cdot Q_0'$$

Seven Segment display

d)



No.	Q_1	Q_0	top
0	0	0	1
1	0	1	0
2	1	0	1
3	1	1	1

Q_1 \ Q_0	0	1
0	1	0
1	1	1

$$top = Q_0' + Q_1$$

Unassigned ~~don't care~~ States:

e)

I_1	I_0	Q_1	Q_0	D_1 (assigned from don't cares)	D_0	next State ~~next State~~ unassigned?
0	1	0	1	1	0	no = "2"
1	0	1	1	0	0	no = "0"
1	1	0	0	1	0	no = "2"
1	1	1	1	0	0	* yes, but, ~~the state after~~ the unassigned State after * 1100 "redirects" to a stable state.

So: If the circuit is in one of the unassigned states when switched on, it will always correct itself after one or two clock changes to one of the known states