

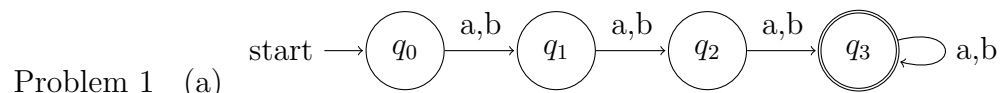
# ECS 120 Problem Set 2

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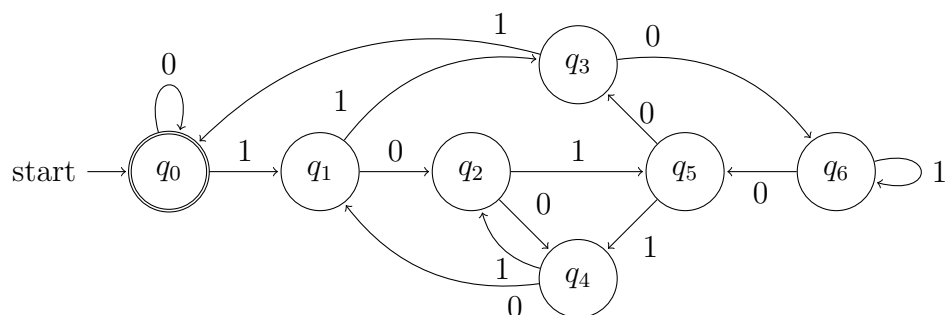
(b) The hint given provides some intuition. We have to realize what happens when we see a new binary digit. Given the current value  $p$ :

- i. If the next digit is 0, then we have  $2p$ .
- ii. If the next digit is 1, then we have  $2p + 1$ .

We can catalog the effect in a table.

$p \equiv n \pmod{7}$	$2p \equiv n \pmod{7}$	$2p + 1 \equiv n \pmod{7}$
0	0	1
1	2	3
2	4	5
3	6	0
4	1	2
5	3	4
6	5	6

We can then map these directly to states, where 0 is the only accepting state.



(c) We can extend the DFA presented above to ignore  $\varepsilon$  and leading zeros.

