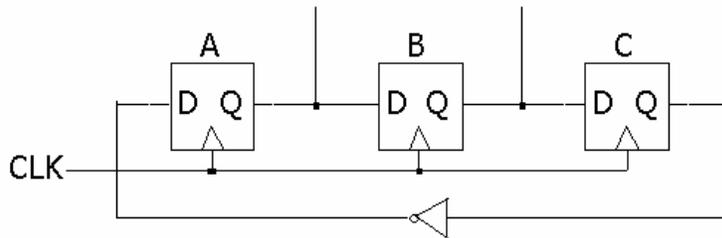


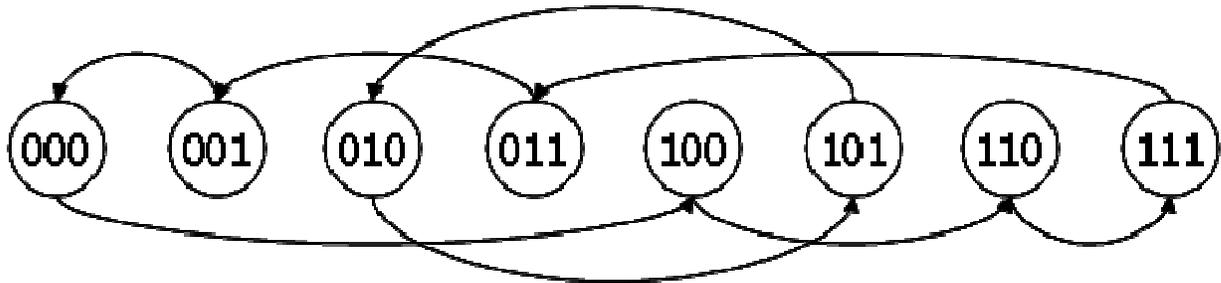
CSE370 Quiz 4 (17 November)

Name _____ Solution _____

Below is a simple counter that sequences through 6 different bit patterns.



Extract the state diagram for this counter. Assume, for now, it starts in state 000. Make sure the state diagram is complete.



Is this a self-starting counter?

Circle one of:

YES

NO

If it is not self-starting then change the equations ($\{A.d, B.d, C.d\} = \{\sim C.q, A.q, B.q\}$) to make the counter self-starting. Start by filling in the K-maps below from the state diagram and clearly show how to make different state transitions for the states not in the 6 state counter sequence so that the new equations will be as simple as possible.

| | | | | |
|-----|-----|---|---|---|
| A.d | A.q | | | |
| | 1 | 1 | 1 | 1 |
| C.q | 0 | 0 | 0 | 0 |
| | B.q | | | |

| | | | | |
|-----|-----|---|---|---|
| B.d | A.q | | | |
| | 0 | 0 | 1 | 1 |
| C.q | 0 | 0 | 1 | 1 |
| | B.q | | | |

| | | | | |
|-----|-----|---|---|---|
| C.d | A.q | | | |
| | 0 | 1 | 1 | 0 |
| C.q | 0 | 1 | 1 | 0 |
| | B.q | | | |

We need to change the transitions from 010 and 101 so that they fall into the 6-state counting sequence within a couple of cycles. We can do this most simply by changing the transition from 101 to 011 instead of 010. This only changes one bit in the K-maps (the bottom right cell of C.d's K-map. This makes the equations:

$$\{A.d, B.d, C.d\} = \{\sim C.q, A.q, B.q + A.q C.q\}$$

A's and B's are unchanged, C's now has two terms.