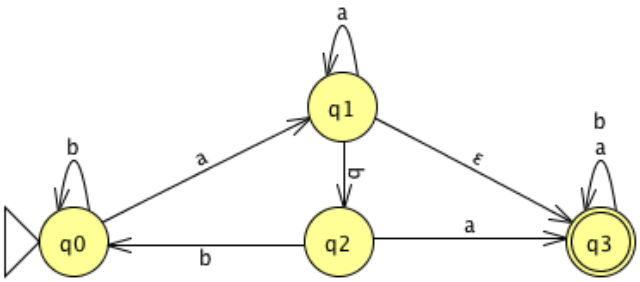
**CS 361– Homework 4**

*Total possible points: 75*

1. (15 points) Use the rules of the proof of **Lemma 1.60** (or the method we used in class) to **convert** the following FA into a **regular expression**. (Remove states in *numerical order* and show all your *intermediate steps* for full credit.)




2. (10 points) Describe the **error**[1] in the following "proof" that 0*1* is not a regular language: "The proof is by contradiction. Assume that 0*1* is regular. Let p be the pumping length for 0*1* given by the pumping lemma. Choose s to be the string $0^p1^p$. We know that s is a member of 0*1*, but we know from the proof of B=$\{0^n1^n \mid n \geq 0\}$ not being regular[2] that s cannot be pumped. Thus we have a contradiction. So 0*1* is not regular."

3. (15 points) Using the pumping lemma for regular languages show that the following language is not regular

$$L_1 = \{a^m b^{m+3} \mid m > 0\}$$

4. (15 points) Using the pumping lemma for regular languages show that the following language is not regular

$$L_2 = \{wcw \mid w \text{ is over } \{a, b, c\}^*\}.$$

For example if w = cab then string cabccab ∈ $L_2$.

5. (20 points) Let $\Sigma = \{c, d\}$ and $L_3$= $\{c^n d^m \mid n < m;\ n, m \geq 0;\ 1 < n < 3\}$. If $L_3$ is regular, build the corresponding FA that accepts the languages. If not, demonstrate that by using the pumping lemma proof.

[1] An error must exist in this proof because 0*1* is regular.

[2] This proof is both in the textbook and lecture notes for the class.