CS 360 Winter 2016
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Problem Session 2

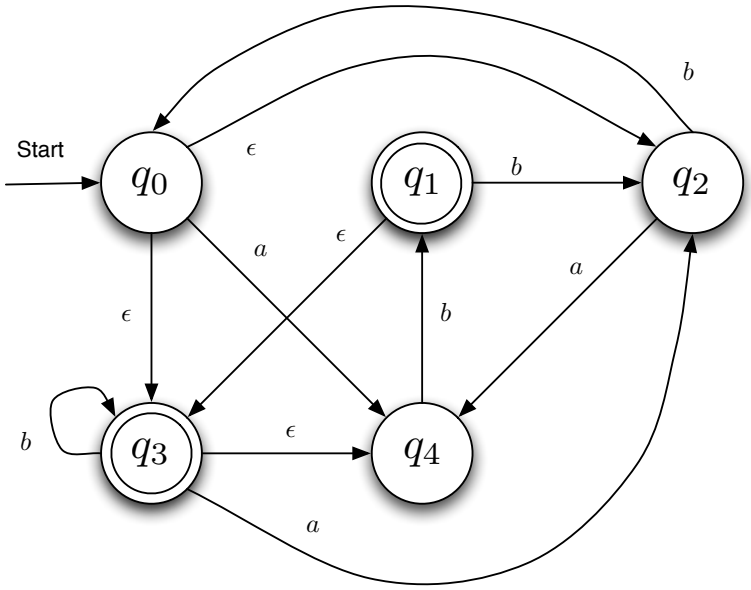
The problems below are a rough indication of the material to be covered in the session. The amount of time spent on each topic will depend on the needs of those attending. For discussion of solutions, attend the session or talk to course personnel in office hours.

1. [**Construction regular expressions**] Find regular expressions for the following languages.

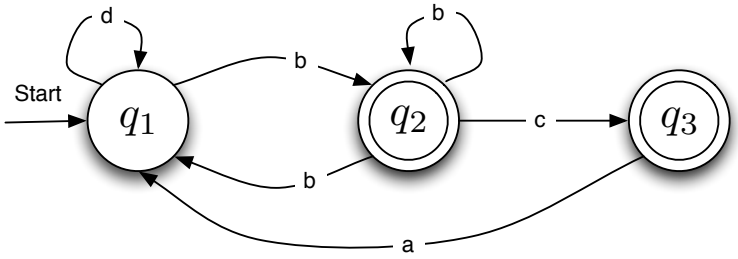
   (a) all strings over $\{a, b\}^*$ that begin or end with ab or ba

   (b) all strings over $\{a, b\}^*$ that contain both aa and bab as substrings

2. [**Conversion ϵ-NFA to NFA**] Convert the following ϵ-NFA into an NFA.



3. [**State elimination method**] Use the state elimination method to form a regular expression equivalent to the ϵ-NFA illustrated below. Remove states in order from highest numbered name to lowest.



4. [**Pumping lemma**] Use the pumping lemma to prove that L is not regular for $L = \{a^i b^j c^i \mid i \geq 1, j \geq 1\}$

5. [**Closure properties**] Use closure properties to show that L is not regular, where $L = \{w \in \{0,1\}^* \mid |w| \text{ is prime}\}$.

6. [**Decision problems**] Give an algorithm that solves the following decision problem: "Given a regular expression α, does $L(\alpha)$ contain a string of length five?"