# CS 311 Homework 5

due 16:40, Thursday, $28^{th}$ October 2010

Homework must be submitted on paper, in class.

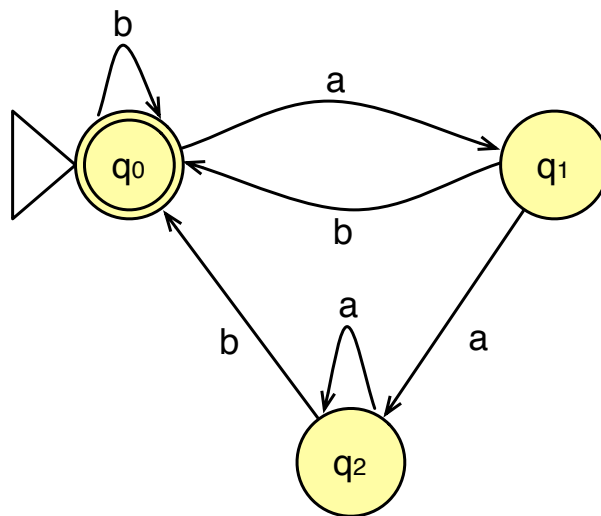## Question 1. [30 pts.; 15 pts. each]

Prove that the following languages are not regular using the pumping lemma.

    *a.* $L = \{0^n 1^m 0^n \mid m, n \geq 0\}$.

    *b.* $L = \{wtw \mid w, t \in \{0, 1\}^+\}$.

## Question 2. [20 pts]

Convert the following DFA into a regular expression using state elimination. Be sure to show intermediate steps of the process.



## Question 3. [30 pts.; 15 pts. each]

Write context free grammars that generate the following languages. In each case use the alphabet $\Sigma = \{0, 1\}$.

    *a.* $\{x \# y \mid |x| \neq |y|\}$.

    *b.* $\{w \mid w$ contains at least two occurences of the substring $101\}$

**Question 4.** [20 pts. each]

Construct PDAs that recognize the following languages:

a. $L = \{a^i b^j \mid i > j\}$

b. $L = \{xcy \mid x, y \in \{a, b\}^* \text{ and } \wedge x \neq y^R\}$