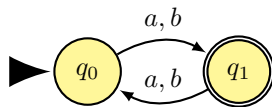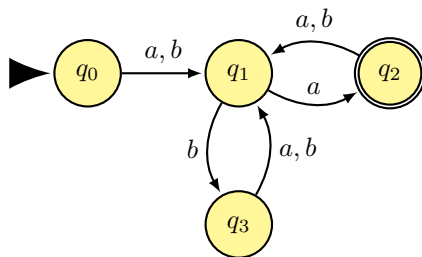# CSCI 340 — Homework 2

Dr. Killian

Due: February 5, 2021 @ 11:59PM

1. For each of the problems below, give a regular expression which only accepts the following. Assume $\Sigma = \{a \ b\}$

   (a) All strings that begin and end with the same letter

   (b) All strings in which the total number of a's is divisible by 3

   (c) All strings that end in a double letter

2. Show the following pairs of regular expressions define the same language

   (a) $(\mathbf{ab})^*\mathbf{a}$ and $\mathbf{a(ba)}^*$

   (b) $(\mathbf{a^*bbb})^*\mathbf{a}^*$ and $\mathbf{a^*(bbba^*)}^*$

3. Describe (in English phrases) the languages associated with the following regular expressions

   (a) $(\mathbf{a+b})^*\mathbf{a}(\lambda + \mathbf{bbbb})$

   (b) $(\mathbf{a(aa)^*b(bb)^*})^*$

   (c) $((\mathbf{a+b})\mathbf{a})^*$

4. Build an FA that accepts only the language of all words with b as the second letter. Show both the picture and the transition table for this machine and find a regular expression for the language.

5. Find two FA's that satisfy these conditions: Between them they accept all words in $(\mathbf{a+b})^*$, but there is no word accepted by both machines.

6. Describe the languages accepted by the following FA's:

   (a)

   (b)

   (c)