1. (5 points) What is your favorite movie?

2. (5 points) True/False: Given a finite alphabet, there are well-specified formal languages that \textbf{can not} be recognized by regular expressions, FSAs or regular grammars.

3. English has a class of adjectives that make use of the –ed suffix, as in “powdered milk”, “boxed set”, and “candied apple”.
   a) (5 points) Is the process of going from the stem form to the –ed form in these examples an instance of inflectional or derivational morphology?
   
   b) (10 points) Describe the processes that would be involved in morphological processing of the “candied” example using FSTs.

4. Our sheep talk language is succinctly captured by the regular expression (baa*!).
   a) (10 points) Given access to a corpus of utterances by native speakers of this language, describe how you would \textit{instead} capture this language as statistical language model using character-level bigrams. Include all the steps that would be involved.

   b) (5 points) What capabilities of the regex approach are lost in your new probabilistic approach (if any?).
5. (10 points) Parts of speech (or lexical categories) for words are determined by their morphological behavior and syntactic distributional properties. Give examples of each of these (morphological and syntactic) for the noun school.

6. Consider the Ice Cream HMM shown below. Using the notation and variables from this figure characterize the following values (symbols and variables are fine; you don’t need to compute the actual answers):

   a) (5 points) The a priori probability of the sequence HHC (a priori means without evidence; that is without any particular observation sequence).

   b) (5 points) The probability of the state sequence CHC given the observation 313.

   c) (5 points) The probability of being in state H at time 3, given the observation 313.

   d) (5 points) Is the Viterbi algorithm of any use in computing the answer to part b?
In this figure, time starts at 1; Cold states have the value 1, and Hot states have the value 2. So the notation $\alpha_{i}(j)$ represents the $\alpha$ value of state $j$ at time $i$. 

$\alpha_{1}(2) = 0.32$ 

$\alpha_{2}(2) = 0.32 \times 0.14 + 0.02 \times 0.08 = 0.00608$