Fall 2013 **Exam #1** COSC 362

Name: _____

Write all of your responses on the exam paper or on the extra paper provided. Turn in all work and this exam paper.

1. (*10 Points Each*) Answer the following questions on languages and grammars.

   (a) Prove that for every two languages L_1 and L_2 that $(L_1L_2)^R = L_2^R L_1^R$.

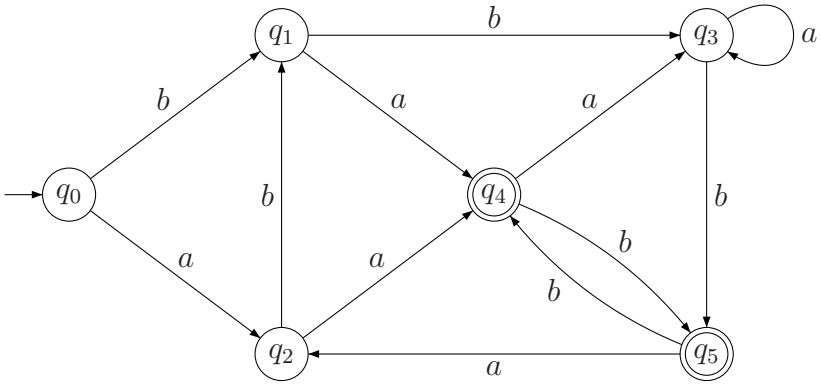
   (b) Give a grammar for the language of all non-empty palindromes.

2. (*10 Points Each*) For each of the following languages, give a regular expression for that language.

   (a) $L = \{vwv \mid v, w \in \{a, b\}^*, |v| = 2\}$

   (b) $L \subset \{0, 1\}^*$, is the language where each word contains an even number of 0's.

3. (*35 Points*) Consider the following DFA, A.



(a) Determine if the automaton accepts the following words. Display the sequence of states for each word.

i. *aabbaa*

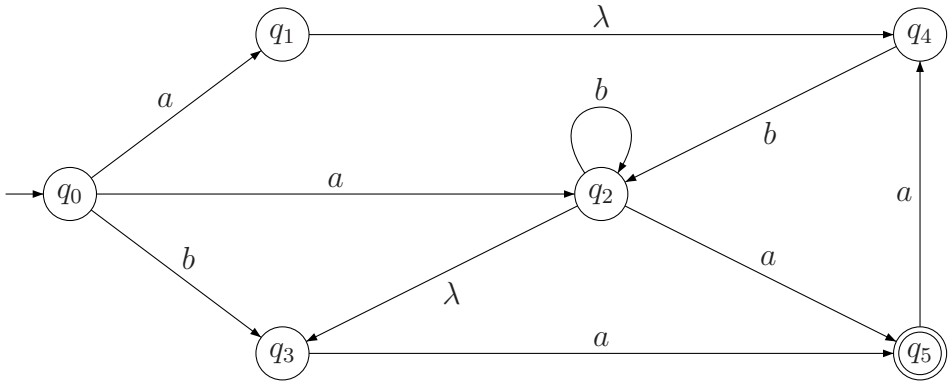
ii. *bbaabbaa*

iii. *ababab*

(b) Is $L((aabb)^*) \subseteq L(A)$? Why or why not? If not, what is the largest subset of $L((aabb)^*)$ that is a subset of $L(A)$?

(c) Fill in the blank with the appropriate condition(s) $\{b^m a^n \mid \_\_\_\_\_\} \subseteq L(A)$. Justify your answer.

4. (*35 Points*) Consider the following NFA, A.



(a) Determine if the automaton accepts the following words. If it does, display the sequence of states that drive the word to a final state.

i. *abab*

ii. *abbbaaba*

iii. *bbaab*

(b) What is the largest run of a's in any accepted word? List all of the words with that number of runs.

(c) What is the largest number of a's that can end any accepted word of length at least 5? Justify your answer.

(d) Convert this NFA to a DFA.