## CSE 311 Quiz Section: May 16, 2013

## 1. Regular Expressions

Express each of these sets using a regular expression:
a) The set of strings of one or more 0 s followed by a 1
b) The set of strings of odd length
c) The set of strings not containing 000 and ending with a 1
d) The set of strings containing a string of 1 s such that the number of 1 s is equivalent to $2 \bmod 3$, followed by an even number of 0 s

## 2. Recursive Definitions and Structural Induction

Let $S$ be the subset of the set of ordered pairs of integers defined recursively by:
Basis Step: $(0,0) \in S$
Recursive Step: If $(a, b) \in S$, then $(a, b+1) \in S,(a+1, b+1) \in S$, and $(a+2, b+1) \in S$.
a) List the elements of $S$ produced by the first four applications of the recursive definitions.
b) Use structural induction to show that $a \leq 2 b$ whenever $(a, b) \in S$.

## 3. Context-Free Grammars

Find a context-free grammar for each of the following languages:
a) the set of all bit strings containing an even number of 0 s and no 1 s
b) the set of all bit strings containing ten or more 0 s and no 1 s
c) the set of all bit strings containing an odd number of 0 s followed by an even number of 1 s

