University of Nevada, Las Vegas Computer Science 456/656 Spring 2019

Assignment 5: Due April 1, 2019

Name:_____

Print this document and staple, along with any extra sheets you want graded. Fill in answers by hand, not by typing or by computer. Hand it to the graduate assistant at the beginning of class on April 1. You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own.

1. A function is said to be computable, or recursive, if it is computed by some machine. There are uncomputable functions, such as the busy beaver function. We write $\Sigma(n)$ for the n^{th} value of the busy beaver function, as explained on the following web page.

   `http://googology.wikia.com/wiki/Busy_beaver_function`

   Does there exist a machine with no input whose output is the list consisting of the first 100 values of the busy beaver function in order, that is: $\Sigma(1), \Sigma(2), \ldots \Sigma(100)$?

2. State the pumping lemma for context-free languages. Be precise, and write legibly.

3. Complete the ACTION and GOTO tables of an LALR parser for the grammar given below. This grammar ambiguously generates the an algebraic language which has the operators addition, subtraction, multiplication, and negation. Since the grammar is ambiguous, you must resolve the shift-reduce conflicts by making choices in the action table. The parsing must be consistent with the precedence rules of C++. That is, addition, subtraction, and multiplication are left-associative, and multiplication has precedence over addition and subtraction, and negation has the highest precedence. The token **id** represents an arbitrary identifier.

1. $E \rightarrow E_{1,11} +_2 E_3$
2. $E \rightarrow E_{1,11} -_4 E_5$
3. $E \rightarrow E_{1,3,5,11} *_6 E_7$
4. $E \rightarrow -_8 E_9$
5. $E \rightarrow (_{10} E_{11})_{12}$
6. $E \rightarrow \mathbf{id}_{13}$

	id	+	−	∗	(	)	**eof**	E
0								
1							**halt**	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								