COP5621 Compiler Construction Exam 2 - Spring 2007

Name: _____ (Please print)
Put the answers on these sheets. Use additional sheets when necessary. You can collect 100 points in total for this exam.

1. Which of the following terms describes a parsing error recovery strategy? (mark **one or more**) (4 points)

   (a) Viable prefix

   (b) Error productions

   (c) Panic mode

   (d) Left factoring

2. Which of the following strings is recognized by this grammar? (mark **one**) (4 points)

   $$S \rightarrow \mathbf{a}\ S\ \mathbf{b}\ \mathbf{b} \mid \varepsilon$$

   (a) **aabb**

   (b) **bb**

   (c) **aabbbb**

   (d) **aaaabb**

3. Circle the language relationships between LL(1), LR(0), SLR, LR(1), and LALR(1) grammars in a diagram, i.e. which grammars are proper subsets of others or overlap? (7 points)

4. Consider the grammar:

$$A \quad \rightarrow \quad \mathbf{a}\, A\, \mathbf{b}\, A \mid \mathbf{c}$$

Give a leftmost derivation of the string **aacbcbc**. (10 points)

5. Consider the grammar:

$$\begin{array}{lcl} A & \rightarrow & B\ \mathbf{a} \mid C\ \mathbf{b} \\ B & \rightarrow & A\ A \\ C & \rightarrow & B \mid \mathbf{a} \end{array}$$

   (a) Eliminate left recursion (in general) from the grammar. (10 points)

   (b) The original and modified grammars are **not** LL(1). Show this for both cases. (5 points)

6. Consider the following grammar:

				FIRST(α)	*FOLLOW(A)*
(1)	*start*	$\rightarrow$	*decl stmt*		
(2)	*decl*	$\rightarrow$	*type list* **;**		
(3)	*type*	$\rightarrow$	**int**		
(4)		$\mid$	**string**		
(5)	*list*	$\rightarrow$	**id** *more*		
(6)	*more*	$\rightarrow$	**, id** *more*		
(7)		$\mid$	ε		
(8)	*stmt*	$\rightarrow$	**id :=** *expr*		
(9)	*expr*	$\rightarrow$	**id**		
(10)		$\mid$	**num**		

(a) For each production $A \rightarrow \alpha$, determine FIRST(α) and FOLLOW(A). (10 points)

(b) Construct the LL(1) parsing table. (10 points)

7. Consider the grammar:

$$
\begin{array}{lcl}
A & \rightarrow & C\ \mathbf{a}\ B\ \mathbf{a} \\
A & \rightarrow & B \\
B & \rightarrow & C \\
C & \rightarrow & \mathbf{b}
\end{array}
$$

   (a) Disprove that the grammar is SLR. (10 points).

   (b) Construct the LR(1) sets of items. (15 points).

   (c) Construct the LR(1) parsing table. (15 points).