Computer Science Comprehensive Exam—Spring 2009
Compiler Construction (with some answers)

Instructions: Do not put your name on the exam, please answer all the questions directly on the exam itself. You may need scratch paper. Answer all the questions. Explain answers as fully as possible, give examples or define terms, if appropriate.

1. Suppose you are writing a LALR(1) parser generator (not a parser). The parser generator will produce code in an object-oriented language like C++ or Java. You want the parser generator to not just simply detect syntax errors, but to automatically generate the parse tree as well. Please describe in words and at a high-level how you would design the parser generator.

Answer:

2. What is the relationship between the set of languages recognized by LR(1) parsers and the set of languages recognized by LL(1) parsers?

Answer:

3. Compute nullable, FIRST, and FOLLOW for all non-terminals in the following grammar. (S’, S, X, B, and E are nonterminals.) Construct the LL(1) parsing table for the following grammar. And, comment on the results. Is the grammar LL(1)?

```
0  S'  →  S$  
1  S   →  
2  S   →  XS  
3  X   →  BSE  
4  X   →  {S}  
5  X   →  word  
6  X   →  begin  
7  X   →  end  
8  X   →  /word  
9  B   →  /begin{word}  
10 E   →  /end{word}  
```

4. Construct the LR(1) parsing table for the following grammar. And, comment on the results. Is the grammar LALR(1)?

```
0  S'  →  S$  
1  S   →  (X  
2  S   →  E]  
3  S   →  F)  
4  X   →  E)  
5  X   →  F]  
6  E   →  A  
7  F   →  A  
8  A   →  
```