Midterm

CIS 756, Fall 1998

October 30, 1998

Read the whole exam first	(there are 6 pages) a	and plan your time.	You have 48 minutes to
complete all three questions. T	There are a total of 10	00 points. The exan	n is open book and open
notes, but closed neighbors. Go	od luck!		

Name:

Student-ID:

1. Scanning (30 pts)

Consider the following format for floating point literals. Assume a fraction part consisting of a string of one or more decimal digits with an optional decimal point (period) that can be added immediately before or after *any* of the digits. In addition, an optional exponent can be appended to the fraction part, consisting of an e or E, followed by an optional sign, followed by one or more decimal digits. A floating point literal must contain either a decimal point, or an exponent, or both.

Examples: .0, 0., 0.1, .01e-01, 01E00

(a) (15 pts) Draw an NFA for this construct.

(b) (15 pts) Give a regular expression for it. You may use ϵ .

2. Context free grammars, LL parsing (30 pts) Consider the following grammar:

$$\begin{split} E &\rightarrow E + T \mid T \\ T &\rightarrow \operatorname{id} \mid \operatorname{id}() \mid \operatorname{id}(L) \\ L &\rightarrow E; L \mid E \end{split}$$

The nonterminals are E, T, and L. The terminals are +, id , (,), ;. The start symbol is E.

(a) (15 pts) Modify the grammar such that it can be parsed by an LL(1) parser.

(b) (15 pts) Show Nullable, FIRST, and FOLLOW and derive the LL(1) parse table for the modified grammar.

3. Context free grammars, LL and LR parsing (40 pts) Consider the following simple context free grammars:

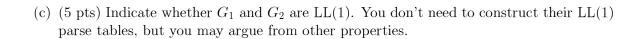
Grammar G_1	Grammar G_2
$G \to A$ \$	$G \to A$ \$
$A \to \epsilon$	$A \to \epsilon$
A o bAb	A o Abb

The start symbols are G, the nonterminals are G and A, and the terminal symbols are b and a. Note that these grammars generate the same language: strings consisting of even numbers of a symbols (including zero of them).

(a) (15 pts) Attempt to show a shift-reduce parse of the input string bbbb for a parser for grammar G_1 . Show the contents of the stack, the input, and the actions (in the style of Figure 3.18 on Page 58 but without the subscripts for the parse states).

Indicate any conflicts and describe why they are conflicts. Is $G_1 LR(1)$? Is it LR(0)?

(b) (15 pts) Attempt to show a shift-reduce parse of the input string bbbb for a parser for grammar G_2 . Show the contents of the stack, the input, and the actions (in the style of Figure 3.18 on Page 58 but without the subscripts for the parse states). Indicate any conflicts and describe why they are conflicts. Is G_2 LR(1)? Is it LR(0)?



(d) (5 pts) Of the language classes we have discussed in class, what is the *smallest* category into which $L(G_1)$ fits? Justify your answer. [Hint: This is a trick question!]