

# Computer Science 320: Midterm Examination

March 9, 2000

You have 1.5 hours to answer the following four questions. This midterm is closed book/closed notes. Each problem is weighted equally. For partial credit, show all work. Put your name on every page. Write out and sign the Honor Code pledge before turning in the test.

*"I pledge my honor that I have not violated the Honor Code during this examination."*

## **Problem 1:**

Merriam-Webster defines *palindrome* as:

a word, verse, or sentence (as "Able was I ere I saw Elba") or a number (as 1881) that reads the same backward or forward

Perform the following:

1. Briefly discuss why regular expressions cannot recognize arbitrary length palindromes.
2. Write a grammar which accepts arbitrary length palindromes consisting of the the letters d, e, n, o, r, and v. The palindrome may contain spaces and periods which should be filtered out by the lexer. Define the tokens you use in your grammar using regular expressions. Define a regular expression which matches characters to be filtered.
3. Show how solution would accept:

`never odd or even.`

by first showing the tokenization of the string and then showing the complete parse tree generated.

**Problem 2:**

Build a *Deterministic Finite Automaton* (DFA) that recognizes the following regular expression:

$$(ab|c)^*ba$$

**Problem 3:**

Is the following grammar in SLR? Prove your answer in an organized manner.

$$\begin{array}{ll} S' \rightarrow S\$ & A \rightarrow d \\ S \rightarrow b A c & A \rightarrow A a B \\ S \rightarrow B c & B \rightarrow d \end{array}$$

**Problem 4:**

TRUE/FALSE:

1. If  $r$  is a regular expression, then  $(r+)^* = r^*$  \_\_\_\_\_
2. If  $r$  is a regular expression, then  $(r^*)^+ = r^*$  \_\_\_\_\_
3. Every NFA can be algorithmically transformed into an equivalent DFA \_\_\_\_\_
4. YACC is a SLR parser generator \_\_\_\_\_
5. Changing the order of grammar rules in YACC does not affect conflict resolution \_\_\_\_\_
6. Static links are only necessary for languages that allow nested function declarations \_\_\_\_\_
7. Register accesses are faster than memory \_\_\_\_\_
8. Stacks are FIFO (First-In-First-Out) structures \_\_\_\_\_
9. In a machine where parameters are passed through statically allocated blocks of memory, recursion is not possible \_\_\_\_\_

**Extra Credit:**

The names of some programming languages are palindromes. List as many as you can. Extra credit will be given for each one listed.