

Compilers [Fall 2015] Practice Test I

NAME: _____

Instructions:

- 1) This test is 5 pages in length.
- 2) You have 75 minutes to complete and turn in this test.
- 3) Short answer questions include a guideline for how many sentences to write. Respond in complete English sentences.
- 4) This test is closed books, notes, papers, friends, neighbors, etc.
- 5) Use the backs of pages in this test packet for scratch work. If you write more than a final answer in the area next to a question, circle your final answer.
- 6) Write and sign the following: "I pledge my Honor that I have not cheated, and will not cheat, on this test."

Signed: _____

1. [5 points]

What is a compiler? [1 sentence]

2. [5 points]

Java (unlike DJ) has separate types for booleans and ints, so expressions like `true==1` are not allowed. Also, Java allows the expression `1==0==false==true` but does not allow the expression `true==false==0==1`. Is the `==` operator in Java left-associative, right-associative, or non-associative?

3) [45 points]

a) Draw an NFA that recognizes exactly the binary numbers matching the following regular expression: $(0 | (1^*)) (00 | 11)^* (0^* | 1)$

b) Convert your NFA from part (a) into an equivalent DFA. Draw the equivalent DFA.

c) Minimize your DFA from part (b). Draw the equivalent minimum-state DFA.

4. [45 points]

Is the following context-free grammar in LALR? Provide a proof.

0 $S \rightarrow E\$$
1 $E \rightarrow Ex$
2 $E \rightarrow 0$

Undergraduates stop here. The remaining problem is for graduate students only.

5. [20 points]

Draw a DFA accepting exactly the binary numbers that are multiples of 3, as well as the empty string. Assume that leading zeroes are allowed.