

Print FAMILY name, first initial:\_\_\_\_\_

## Examination 2

Formal Languages and Theory of Computation  
30 October 2003

**Instructions** Read all instructions. Failure to follow instructions will result in loss of points.

1. This is a closed-book examination.
2. You are permitted one 8.5 by 11 inch sheet of notes, both sides, that you have prepared.
3. You are permitted 50 minutes to complete this examination.
4. **Do not start** the exam until the proctor has told you to start.
5. **Answer any two (2) questions.** All questions are of equal value. If you answer more than two, only the first two you answer will be graded.
6. **Leave sufficient room in the upper lefthand corner for the staple** and staple your answer sheets in the room you have left.
7. Start the answer to each question on a new page (i.e., do **not** put the answer to more than one question on the same page).
8. Use exactly one page of paper (both sides is OK) to hold the answer to each question, and please write legibly.
9. Show your work.
10. Put the question number in the top center of each answer page and label each part of the question answer.
11. Include your last name and page number in the upper right hand corner of each answer page.
12. Assemble your answers in numerical order of the questions when you submit them.
13. Print your family name and first initial in the upper right hand corner of this page, and complete the honor statement affirmation below.

**Read and sign the following statement.** This page **MUST** be attached to your examination answers and **MUST** be completed to obtain credit for this examination.

On my honor, I have neither given nor received unauthorized aid on this examination.

Signed:

Printed Name:

UFID:

1. (10) Define a write- $k$  TM to be a TM that can write each tape cell (including the input portion) at most  $k$  times. If the TM attempt to write any cell  $k + 1$  times, it crashes. Show that a write-2 TM is just as powerful as a regular TM.
  
2. (10) Let  $LOOP_{PDA} = \{\langle P, w \rangle \mid P \text{ is a PDA that can enter an infinite loop on } w\}$ . Is  $LOOP_{PDA}$  decidable or not? Prove. Recall that PDAs are non-deterministic, so  $LOOP_{PDA}$  accepts if the PDA described enters an infinite loop on any computational path (obviously not an accepting one) on  $w$ .
  
3. (10) Let  $INTE_{CFG} = \{\langle G_1, G_2 \rangle \mid G_1 \text{ and } G_2 \text{ are CFGs, and } G_1 \cap G_2 \neq \emptyset\}$ . Show that  $INTE_{CFG}$  is not decidable.