

## Automata Theory examination

December 2006

### General instructions

Use of books, notes and Turing machines allowed.

Provide concise answers with short and precise justification.

Write your family name on every page you hand in,

number consecutively all pages that you hand in,

write on the first page the number of pages that you hand in.

No page should contain answers or fragments of answers to more than one question.

### Questions:

1. Over a two-element alphabet  $\{a, b\}$  let  $L$  be the set of those words that do not contain more than 100 consecutive  $a$ 's. Is  $L$  a regular language?
2. Is it more difficult to physically build a Turing machine than to build a DFA ?  
(Please limit your answer to half a page maximum.)
3. Over a 100-element alphabet, is there a DFA with at most 100 states whose language consists of all words whose length is a multiple of 100 ?
4. Why should not we trust the Church-Turing thesis? (Or should we?)  
(Maximum one page.)
5. Over a given input alphabet, is the set of Turing-decidable languages closed under the regular operations?