

Exam questions for the exam in DM553/MM850 June 12-14 2024

1. Pumping lemmas for regular and context-free languages
2. Pushdown automata and context-free languages
3. Turing machines
4. Decidability
5. NP-completeness proofs – examples.
6. Proof that SATISFIABILITY is NP-complete (do not assume that there is a known NP-Complete problem — use the proof in Sipser’s book).
7. Approximation algorithms
8. Information-theoretic lower bounds (lower bounds proven by counting leaves in decision trees) and adversary lower bounds for sorting by comparisons (including lower bounds for average behavior).
9. Adversary arguments – techniques, examples.
10. Fixed parameter algorithms, parametrized complexity and exact exponential algorithms

Information about the exam

The oral exam will take place on June 12-14 for DM553 and MM850. The MM850 students have priority for June 12.

- You will draw a topic from the list of topics listed above. We will use Random.org for this.
- You will have 25 minutes to prepare your presentation. During this time you may use the book, your computer and your notes.
- At the exam itself you may use very short notes that will help you to organize your presentation, but that will have no other technical content (no formulas or proofs).
- The exam will take about 20 minutes per person.
- Prepare your presentation so that it takes no more than 13 minutes. Make sure you cover the most important ideas from your topic, though this may mean that you need to skip some details.
- **Important:** your presentation may be interrupted with questions or cut short to go on to other topics. Note that being interrupted does not necessarily mean what you just said was wrong. Rather it is to make sure we test you full knowledge of the topic you were assigned at the random draw. Hence if I see that you understand some part very well, I may ask you to skip part of it so that you have a chance of showing more knowledge. If I see that you are struggling with something, I will ask a question to help you catch the idea again. **Remember that what we test is not what you could memorize but your understanding of the topics!**
- Towards the end of the exam, you will also be asked questions from other parts of the course, not related to the material you talked about. This may also include a quick question about one of the exam problems that you handed in.
- You may do your presentation in either Danish or English (though Danish is strongly recommended if it is your native language).

Please mail me if you have any questions about the process.