Pensum for the exam in DM553/MM850

April 26, 2023

The material that you are supposed to know is the following, where CLRS is the Cormen book:

1. Non-regular languages. Sipser Section 1.4.

2. Pushdown automata and context-free languages. Sections 2.1-2.3 in Sipser.

3. Turing Machines. Chapter 3 in Sipser.

4. Decidability. Chapter 4 in Sipser (except Theorem 4.17).

5. Reducibility. Sections 5.1 pages 215-220 and Section 5.3 in Sipser.

6. Time Complexity, including definitions of the classes P, NP and NP-complete. Sipser Sections 7.1-7.4

7. NP-completeness proofs. Chapter 34 in CLRS (except pages 1070-1078).

8. Proof that CNF-SAT is NP-complete (The Cook-Levin Theorem). Sipser Section 7.4. We do not use the proof in CLRS as it is not very convincing.

9. Information theoretic lower bounds for sorting by comparisons. Baase Section 2.4 (extra notes from homepage).

10. Adversary lower bound arguments. Baase Chapter 3 and Notes on lower bounds by JBJ (both from homepage).

11. Median problem: both worst case linear time algorithm from CLRS Section 9.3 and the adversary lower bound from JBJ notes and Baase Section 3.5.

12. Approximation algorithms. Chapter 35 in CLRS.

13. Parametrized algorithms. From the textbook of Cygan et al pages 3-8,12-14, 17-22, 51-55 (notes from homepage).

14. Exact algorithms. Pages 1-6 from F.V. Fomin, D. Kratsch, Exact Exponential Algorithms (notes from homepage).

15. All information and problems on the weekly notes.

16. All problems from the 3 exam sets.

17. All information on lecture slides used for the videos (see homepage and resources on itslearning).