

Review sheet for COMP 252 - Winter 2005

The following is a list of the topics that were seen in class before the midterm and that you should review for the final exam. (It is just a copy-paste of some parts of the page <http://www.cs.mcgill.ca/~Ecs252/material.html>)

- *Jan 13*: Quicksort and Simplesort. Probabilistic Analysis of Algorithms. Chapter 7 of CLR.
- *Jan 20*: Lower Bounds I : The Decision Tree Model, The information theory lower bounds for sorting and for searching an ordered array. The Comparison DAG. The information theory lower bound for the kth smallest element.
- *Jan 25*: Lower Bounds II : Adversarial Arguments. The adversarial argument for median finding, finding the maximum and the minimum, and finding the two largest elements. The reduction approach and an example : finding convex hulls.
- *Jan 27*: Priority Queues, Review of Heaps and Heapsort. Binomial Heaps Chapters 6 (Review) and 19 of CLR.
- *Feb 1*: Linear time algorithms for sorting sections 8.2-8.4 of the text. Review of Basic Graph Definitions, Combined Adjacency List-Adjacency Matrix data structure. Section 22.1 of the text. Pre and post order traversal of trees and other basic tree definitions. See Blanchette's web page for cs250. An algorithm for computing the height of a tree using a post order transversal.
- *Feb 3*: DFS-including proof of correctness and use in topological sort and finding strong components. Section 22.3, 22.4,22.5 of CLR.
- *Feb 8*: Despite what the web page says, an important part of this lecture was devoted to strong components, in continuation of the previous lecture, so you should have a look. You don't have to study SAT and 2SAT, though.
- *Feb 15*: Computing the blocks of a graph using Depth First search.

All the material seen after the midterm is subject to examination, with one exception in the last lecture, where we saw the reduction from the hamiltonian cycle problem to Approx-TSP. You are responsible for understanding what a reduction is, but not for the details of that particular reduction. In particular, you don't have to know what NP is.

The questions for the final exam were inspired by the class notes and the assignments. You don't have to know material that is covered in the textbook but was never seen in class.

Finally, here is a list of the topics that were reviewed during the tutorial :

- Midterm exam, question 4 : Show that finding the first and third largest of n elements requires at least $n + \lceil \log n \rceil - 2$ comparisons in the decision tree model. We talked about DAGs, their corresponding partial order and linear extensions, and saw why finding first and third largest necessarily implies finding second largest. Then we saw how to get a lower bound for the problem of finding the first and second largest elements, using an adversarial strategy.
- Hashing with chaining : If n element are hashed in a table T with m slots, and each element is equally likely to be hashed to any particular slot, then the expected size of $T[j]$ is $\alpha = \frac{n}{m}$ and the expected time taken by the Search method is $O(1 + \alpha)$.
- Brief discussion on amortized analysis. The fact that it can be used to analyse the average cost of an operation, when there are different operations that can be done. For example, to analyse the average cost of an operation on a disjoint-set structure, and an operation can be either Make-Set, Find-Set or Union.
- Assignment 6, problem 5 : Closest-point heuristic for approximating Δ TSP. Note that the solution to this assignment is now posted on the web page.

If I forget anything please let me know...

Good luck!