

St. Francis Xavier University
Department of Computer Science
CSCI 435: Algorithms and Complexity
Final Examination Review
Winter 2023

1 Topics Covered

The following list gives an overview of every topic covered in CSCI 435. You should ensure you have a good understanding of each topic. All final examination questions will test some topic on this list, but not all topics will be tested on the final examination.

Although the final examination is a comprehensive examination, there will be a greater emphasis placed on topics covered after the midterm examination.

- **Pre-Midterm Material**

- Review of algorithm design techniques
- Online algorithms
- Randomized algorithms

- **Amortized Analysis**

- Methods of amortized analysis
- Aggregate method
- Accounting method
- Potential method
- Incrementing binary counters
- Array insertion
- Disjoint set data structure

- **Approximation Algorithms**

- The basics
- Performance guarantees
- Polynomial-time approximation schemes
- Greedy technique
- Integer programming
- Linear programming
- Rounding
- Dual rounding
- Primal-dual method
- Weighted/unweighted set cover

- **Fixed-Parameter Algorithms**

- Parameterization
- Bounded search trees
- Kernelization
- Vertex cover problem
- Closest string problem

2 Format

The final examination is 150 minutes (2.5 hours) long. It consists of 5 questions worth a total of 50 marks.

The first question is divided into ten multiple-choice style parts. Multiple-choice questions test both pre- and post-midterm material.

The second question is divided into five short answer style parts. Short answer questions test both pre- and post-midterm material.

The third question is about amortized analysis.

The fourth question is about approximation algorithms.

The fifth question is about fixed-parameter algorithms.

3 Tips and Tricks

- Double-check the date, time, and room of the final examination. You will not get extra time to write if you arrive late.
- Use your time wisely. Short and long answer questions will likely take more time than multiple choice questions, so make sure you allocate the appropriate amount of time for each question.
- Use the resources you are given. The lecture notes contain everything you need to know. The assignment questions are similar in content and difficulty to the final examination questions. The course textbooks serve as great supplementary material.
- Don't leave your questions until the last minute. Seek help before the final examination if you have questions. Send an email or make a post on Moodle.
- Don't try to memorize concepts. Instead, focus on understanding the meaning behind a concept and how it is applied.
- Don't panic!