St. Francis Xavier University
Department of Computer Science

CSCI 355: Algorithm Design and Analysis
Midterm Examination Review
Winter 2022

1 Topics Covered

The following list gives an overview of every topic covered in CSCI 355 up to the midterm examination. You should ensure you have a good understanding of each topic. All midterm examination questions will test some topic on this list, but not all topics will be tested on the midterm examination.

- **Introduction and Stable Matching**
  - The stable matching problem
  - The Gale–Shapley algorithm
  - Optimality of stable matching
- **Algorithm Analysis**
  - Computational tractability
  - Models of computation
  - Types of analysis
  - Asymptotic order of growth
  - Big-O notation
  - Big-Ω notation
  - Big-Θ notation
  - Common running times (polynomial, exponential, etc.)
- **Graphs**
  - Undirected graphs
  - Adjacency matrices and lists
  - Graph connectivity and traversal
  - Breadth-first and depth-first search
  - Connected components
  - Bipartite graphs
  - Directed graphs
  - Graph search
  - Connectivity and strong connectivity
  - Directed acyclic graphs
  - Topological ordering
- **Greedy Algorithms**
  - Coin changing/cashier's algorithm
  - Interval scheduling
  - Earliest-finish-time-first
  - Interval partitioning
  - Earliest-start-time-first
  - Minimizing lateness
  - Earliest-deadline-first
  - Dijkstra's algorithm
  - Spanning trees
  - Minimum spanning trees
  - Prim's algorithm
  - Kruskal's algorithm

2 Format

The midterm examination is fifty minutes long. It consists of 4 questions worth a total of 25 marks.

The first question is divided into 5 multiple-choice style questions. The second, third, and fourth questions are short-answer style questions.

3 Tips and Tricks

- Double-check the date, time, and room of the midterm examination. You will not get extra time to write if you arrive late.
- Use your time wisely. Short 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 midterm examination questions. The course textbook serves as great supplementary material.
- Don't leave your questions until the last minute. Seek help before the midterm examination if you have questions. Attend office hours or send an email.
- Don't try to memorize concepts. Instead, focus on understanding the meaning behind a concept and how it is applied.
- Don't panic!