COSC-211 Spring 2019 Midterm 1 Topics

This is *not* a comprehensive study guide. There may be topics that we have discussed in class or that have come up on homework that are not on this list. You are responsible for all of the course material up to this point, including both in-class material and homework.

1. Java topics

   (a) Classes

      - How to write a class
      - Declaring and using instances of classes
      - Why fields are private, get/set methods
      - Constructors

   (b) Generics

      - Why generics are useful
      - How to make a class generic

2. ADTs

   (a) Stacks

      - What are the supported operations?
      - Array implementation
      - Vector implementation
      - Asymptotic analysis of each of the above

   (b) Queues

      - What are the supported operations?
      - Array implementation
      - Vector implementation
      - Asymptotic analysis of each of the above

   (c) Priority Queues

      - What are the supported operations?
      - Unsorted array implementation
      - Sorted array implementation
      - Heap implementation (you should know what the properties of a heap are, but you do not need to know for this exam how insertion and deletion work or how to implement a heap)
      - Asymptotic analysis for the unsorted array and sorted array implementations

3. Theoretical topics

   (a) Asymptotic analysis

- What is it?
- Best case vs. worst case analysis
- Big-O definition
- Relative growth rate of different types of functions (I will *not* ask you to write proofs, but I *do* expect you to understand intuitively how to order different functions, e.g. $O(1)$ is better than $O(\lg n)$ is better than $O(n)$.)
- Analyzing data structure operations

Some types of questions that I might ask (again, not comprehensive):

- Given a new operation that you haven't seen before, analyze its runtime.

- Given a set of data values, draw one way of organizing that data in a heap.

- Given a simple computational task, write a method that performs it using only queues.

- Compare the runtime of different implementations of the same abstract data type.

- Given a target application, discuss which of a Stack, Queue, and Priority Queue would be the best ADT for the application and why.

You've gotten lots of practice, on homework, with implementing the data structures we've discussed. The exam will focus more on using the data structures and understanding their performance.