The purpose of this handout is to help you study by listing the concepts, definitions, and results you will need to know for the final exam.

Final Exam Information. The exam will be on **Wednesday, April 11, 2007** at **1:00PM - 4:00PM** in the **UC 2011**. You will **not** be allowed to bring in any notes, use the text book, or use a calculator. If a question involves a calculation you may leave it in an unexpanded form, e.g., you can write 5^4 instead of 625, or $C(6,3)$ instead of 20.

Bring your Student ID!

Material Covered. The exam will be cumulative. The exam will cover the material discussed in class about Chapters 1-11. The questions on Chapters 1-8 will be worth approximately 50% of the exam's total, while the material from Chapters 9-11 will be worth the other 50%.

For more information on what you should know from Chapters 1-8, please consult previous handouts. If you are missing these handouts, you can download them from the web at

`http://flash.lakeheadu.ca/~avantuyl/courses/2006_fall_math1281.html`

I have provided a breakdown of what you will need from Chapters 9-11 below.

1. **Section 9.1** Be able to distinguish between a simple graph, multi-graph, pseudo-graph, directed graph, and directed multi-graph.
2. **Section 9.2** You will be required to know all the terms used to describe graphs, for example, degree, endpoints, etc. You should also be able to come up with examples of each term. As well, you should know Theorems 1 and 3. You will also need to know the names describing some simple graphs, e.g., cycle, complete, as well as bipartite graphs, and how to form the union of two graphs.
3. **Section 9.3** Know the various ways to represent a graph (adjacency matrix, incidence matrix). Know what it means for two graphs to be isomorphic.
4. **Section 9.4** Know the definition of a path, circuit, connected graph, strongly connected graph, weakly connected graph. Also, know how to use Theorem 2. You should also be able to find cut edges and cut vertices in a graph.
5. **Section 9.5** Be able to determine if a graph has an Euler path or circuit, or a Hamilton path or circuit. Also know how to use Theorem 1, 2 and 3.
6. **Section 9.6** Know the definition of a weighted graph. Also, you should be able to find the smallest path in a weighted graph.
7. **Section 9.7** Know the definition of a planar graph. Also know Theorem 1, Corollary 1, as well as Theorem 2. You should also know the definition of an elementary subdivision, and a homeomorphic graph. As well, you should be able to use Theorem 2 to determine if a graph is planar.
8. **Section 9.8** Know what a coloring is, as well as the chromatic number. You should be able to determine the chromatic number for a given graph.
9. **Section 10.1** You will need to know the definition of a tree, plus terms like: child, siblings, ancestors, descendants, leaf, root, parent, internal vertices, m-ary tree, full m-ary tree, level, and height. You will also need to know how to use Theorem 4.
10. **Section 10.2** You should be able to construct binary search trees, like Example 1.
11. **Section 10.3** You do not need to know this section.

12. **Section 10.4** Given a graph, you should be able to find a spanning tree. You will also need to know how to use the breadth-first search, and depth-first search algorithms for finding spanning trees. Also know what it means to solve problems via a backtracking method.

13. **Section 10.5** Given a graph, you should be able to find a minimum spanning tree using both Prim's algorithm and Kruskal's algorithm.

14. **Section 11.1** Know the three basic operations in a Boolean algebra - complement, Boolean sum, and Boolean product. Know what a Boolean function is, as well as a Boolean expression. Also, you will be expected to be able to form the dual of a Boolean expression. Know the identities in Table 5. As well, you should be able to determine if two Boolean expressions are equivalent.

15. **Section 11.2** Given a Boolean function, you should be able to find a Boolean expression that represents this function. For example, see Example 1. Know how the two operators NOR and NAND are defined. Also know what it means for a set of operators to be functionally complete.

16. **Section 11.3** Know the three basic logic gates - inverter, AND gate, and OR gate. As well, you should be able to do questions like Examples 1 and 2.

17. **Section 11.4** Know how to use a Karnaugh map to simplify a circuit. Be able to problems like Exercises 4 and 12.

The Weighting of the Exam. When I calculate the final grade, I will weigh the exam in two different ways, and take the higher of the two grades.

> *First Way.* I will use the weighting as described in the course handout, that is, the exam will count for 40% of your final mark.
>
> *Second Way.* I will not use the lower of your two midterm marks, but instead, let your exam count for 55%.

For example, suppose you got 7/10 on your homework, and your first test (after re-weighting) was 10/15 and the second test was 7.5/15, and on your Christmas Exam you received 16/20. Suppose you received 60% on the final. For the first way, your exam would be re-weighted to be 24/40, and you would have a grade of

$$\frac{7}{10} + \frac{10}{15} + \frac{7.5}{15} + \frac{16}{20} + \frac{24}{40} = \frac{64.5}{100}.$$

For the second way, your exam would be re-weighted to 33/55, which would then give you a grade of

$$\frac{7}{10} + \frac{10}{15} + \frac{16}{20} + \frac{33}{55} = \frac{66}{100}.$$

Your final grade would then be the highest of the two, i.e., 66%.

Note. I will be out of town April 4-8 . Except for these days, I will be available in my office from 10AM-4PM to answer questions. Please feel free to drop by to ask me a question, or send me a question via email (`avantuyl@sleet.lakeheadu.ca`) or by phone (343-8228).

Good luck and have a good summer! Adam