Final Study Guide

Basic Information

1

Final Information

- 120 minutes
- 300 points
- May contain multiple choice and short answer questions

2

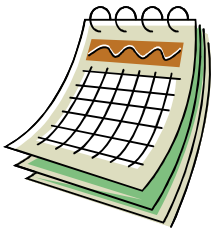
What Will Be Covered

- Exam will cover Parts 1 to 16
- No question will be asked that is not in the lecture notes
- Download from: *devincook.com/csc/130*

3

Exam Time & Date

- Section 1
  - Thursday, December 16th
  - 12:45 pm - 2:45 pm
- Section 2
  - Thursday, December 16th
  - 3:00 pm - 5:00 pm



4

Exam Format

- Canvas supports multiple choice and fill in the blank
- If you fill in an answer – use lowercase (they are case sensitive)

5

Exam Format

- Bring scratch paper! **You will need it!**
- Many questions will have you hand-sort or hand-compute a result

6

Canvas & Apple Safari

- Apple Safari is an excellent web browser, however…
- Student's have reported malfunctions when using Canvas – in particular, *images do not work properly*

7

Canvas & Apple Safari

- The exam will make use of multiple images
- So please use:
  - Firefox
  - Edge
  - Chrome

8

Analysis of Algorithms

Part 1

9

Part 1 – Important to Understand

- Algorithmics
- Time complexity basics
- Big-O notation
- Big-O math

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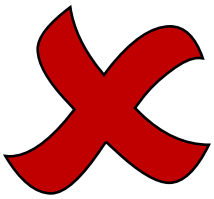
Part 1 – Don't Worry About

- Well Known Problems section
- Example time-complexities
- Big-Theta, Big-Omega
- Towers of Hanoi



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Abstract Data Types

Part 2

12

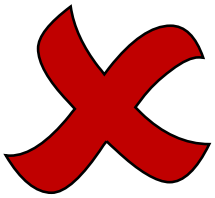
Part 2 – Important to Understand

- What a ADT specifies
- Bags
- Queues
- Stacks
- Deques

13

Part 2 – Don't Worry About

- Cheese example



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Recursion

Part 3

15

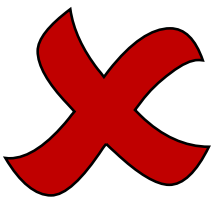
Part 3 – Important to Understand

- Variable Scope
- System Stack
- System Heap
- Loitering
- Pools
- Recursion

16

Part 3 – Don't Worry About

- Historical Perspective



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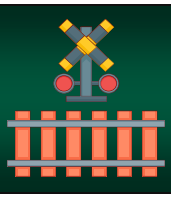


Queues & Stacks in Practice

Part 4

18

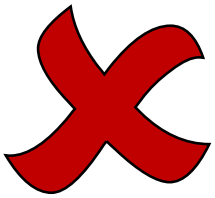
Part 4 – Important to Understand

- Prefix, Postfix, Infix
- Shunting Yard Algorithm

19

Part 4 – Don't Worry About

- Implementing the Shunting-Yard Algorithm (we didn't have an assignment)



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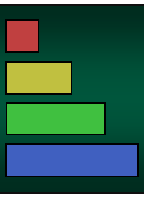


Binary Search & Basic Sorting

Part 5

21

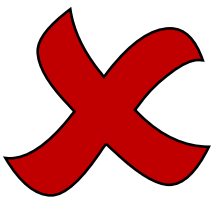
Part 5 – Important to Understand

- Binary Search
- Bubble Sort
- Selection Sort
- Insertion Sort
- Shell Sort
- …. and all their attributes

22

Part 5 – Don't Worry About

- The fact that Shell Sort is named after a person!
- Gap values of Shell Sort
- You won't be asked to manually sort any of these algorithms



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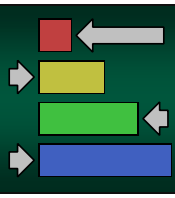


Recursive Sorting

Part 6

24

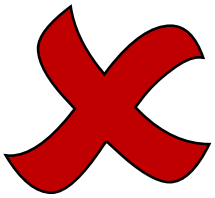
Part 6 – Important to Understand

- Merging arrays
- Merge Sort
- Quick Sort

25

Part 6 – Don't Worry About

- *Know it all*



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Non-Comparative Sorting

Part 7

27

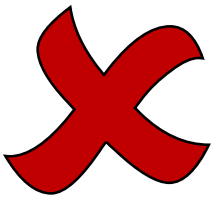
Part 7 – Important to Understand

- Dictionaries
- Bucket Sort
- Radix Sort

28

Part 7 – Don't Worry About

- The Census Crisis & the history of the Radix Sort



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Trees

Part 8

30

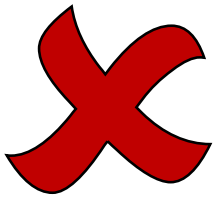
Part 8 – Important to Understand

- Tree terminology
- Tree are recursively defined
- Tree traversals
- Binary trees

31

Part 8 – Don't Worry About

- Example trees
- …especially the Cheese one



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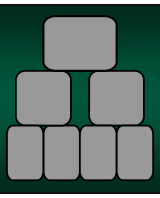


Heaps & Priority Queues

Part 9

33

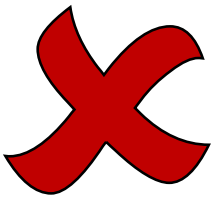
Part 9 – Important to Understand

- Heaps – both min-heaps and max-heaps
- Priority Queues
- Heaps in arrays (how the math works)
- Heap Sort

34

Part 9 – Don't Worry About

- All the various alternative names for upheap and downheap



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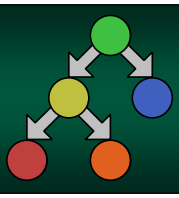

Binary Search Trees

Part 10

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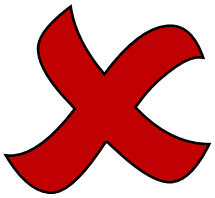
Part 10 – Important to Understand

- Binary Search Trees (BST)
- The dangers of a BST

37

Part 10 – Don't Worry About

- *Know it all*



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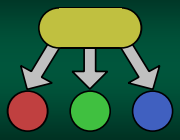


Balanced Trees

Part 11

39

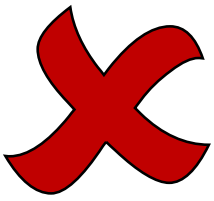
Part 11 – Important to Understand

- 2-3 Trees
- AVL Trees
- Red-Black Trees – what they really are

40

Part 11 – Don't Worry About

- Who created these trees algorithms and when



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Hashing

Part 12

42

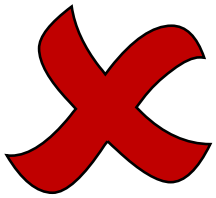
Part 12 – Important to Understand

- General approach of Hash Tables
- Hash functions
- Open Hashing
- Closed Hashing

43

Part 12 – Don't Worry About

- All the examples
- Sample hash function – MAD algorithm



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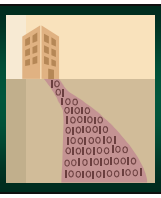

Set Data Structures

Chapter 13

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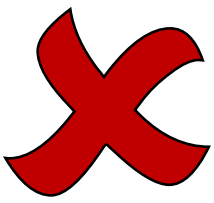
Part 13 – Important to Understand

- Union-Find
- Bit Vectors

46

Part 13 – Don't Worry About

- *Know it all*



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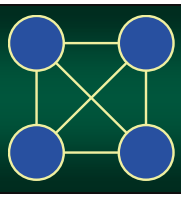

Graphs

Part 14

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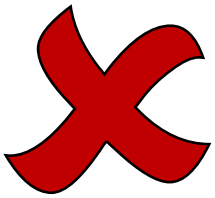
Part 14 – Important to Understand

- Graph terminology
- Definition of trees
- Cycles
- Weighted Graphs
- Directed Graphs

49

Part 14 – Don't Worry About

- *Know it all*



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Minimum Spanning Trees

Part 15

51

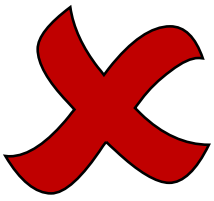
Part 15 – Important to Understand

- Unpracticality of Brute Force
- Kruskal Algorithm
- Prim-Jarnik Algorithm

52

Part 15 – Don't Worry About

- Years these algorithms were created (which is the same year)



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Dijkstra's Shortest Path Algorithm

Part 16

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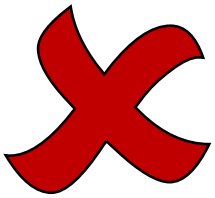
Part 16 – Important to Understand

- Concepts behind the algorithm
- Why it is so important
- Differences from a Minimum Spanning Tree

55

Part 16 – Don't Worry About

- Those catchy lyrics!



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