

Final Exam Review

CS 2308 / CS 5301
Spring 2020

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1

Final Exam

- Thursday May 7, 11:00am-1:30pm
- Online: Canvas Quiz (I plan to be on zoom)
- Open book, open notes
- Comprehensive (covers entire course)
- 25% of your final grade (both classes)

- No collaboration of any kind
- No using other apps or browsing the internet

2

Exam Format

- 100 points total:
 - * 48 pts:
 - Multiple choice
 - 20-24 questions
 - * 52 pts:
 - Writing programs/functions/classes/code
 - Finding errors in code
 - 6 questions (1 per unit)

3

Content

- 7 topics:
- Unit 1 Functions, Arrays, & Structs
 - Unit 2 Searching, sorting & analysis
 - Unit 3 Pointers & dynamic memory allocation
 - Unit 4 Intro to Classes
 - Unit 5 Linked Lists + List ADT
 - Unit 6 Stacks & Queues
 - Linux

4

Unit 1: Functions, Arrays & Structs

- Know how to program with functions, arrays and structures.
- Passing parameters by reference (and value)
- Scope rules
- Be able to process arrays (& arrays of struct)
 - Be able to find the minimum/maximum value!
 - See review exercises
- Be able to trace code
- Be able to find errors in code

5

Unit 2: Searching, Sorting & Analysis

- Searching
 - Linear Search
 - Binary Search
- Sorting
 - Bubble Sort
 - Selection Sort
- See review exercises:
 - Sample exercises to demonstrate algorithms
 - Be able to modify the searching algorithms

6

Analysis of Algorithms: efficiency

- Efficiency
 - Growth rate functions, which are faster/slower
 - Use big-O notation
 - Efficiency of
 - ▶ searching/sorting algorithms
 - ▶ array access and traversal (new!)
 - ▶ linked list operations (new!)
 - See the Final Exam Review Exercises for good coverage on this, including the new! ones

7

Unit 3: Pointers & Dynamic Memory Alloc

- Pointer variables: how to define + initialize
- Address of (&) and Dereferencing (*) operators
- Pointers and arrays
 - * an array variable is the address of its first element
 - * $\text{array}[\text{index}] = *(\text{array} + \text{index})$
- Dynamic memory allocation
 - * new + delete operators
 - * allocate new arrays (duplicateArray, etc.)
- Pointers as parameters (call by reference, arrays)

8

Unit 4: Intro to Classes

- Procedural vs object oriented programming
- Encapsulation, Data hiding, Interface
- Fundamentals of classes and objects:
 - Members: variables and functions
 - private vs public
 - declaration and implementation of classes
 - ▶ class declaration
 - ▶ defining member functions
 - instances and the dot operator
 - inline member function definitions
 - constructors and destructors
 - arrays of objects

9

C++ Programming on Linux

- Basic shell commands, know how to use
- edit, compile, run (nano, g++, a.out)
- Compiling multiple files:
 - How to split up code, what goes where
 - g++ a.cpp b.cpp
 - separate compilation
 - g++ -c a.cpp
 - g++ -c b.cpp
 - g++ a.o b.o
 - makefile: understand the ones used for the assignments, know how to use them

10

Unit 5: Linked Lists

- Pointers to Struct: declaration, access ($s \rightarrow x$)
- LL Organization: nodes, head pointer, empty list, NULL
- Linked list tasks: T1-T11:
 - create empty list, create a new node
 - add to front of list
 - append to end of non-empty list
 - traversing a linked list (display, count, sum, etc)
 - how to advance 2 pointers together (n and p)
 - delete given n and p, special cases
 - insert given n and p, special cases
 - linked list destruction
- Arrays vs Linked Lists (see ListADT, last 2 slides)

11

Unit 6: Stacks and Queues

- ADT, LIFO and FIFO
- 4 basic operations of each data type:

pop	enqueue	isEmpty
push	dequeue	isFull
- Be able to show contents of stack or queue after a series of operations
- Be able to implement the operations (code in C++) using a static array or a linked list.
- Be able to use a driver to access a stack or queue.

12

Sample Problems

See the lecture notes titled:

Final Exam Exercises

on the class website (soon)

13

How to Study

- Start with the topics from this set of slides.
- Use the regular semester lectures to make sure you understand the topics (quiz yourself, use the Squarecap questions).
- Use the textbook to make sure you understand the lectures about the topics.
- **Do** the review exercises on the Final Exam Exercises slides. Do book exercises. Practice!!
- Go over the exams and assignment solutions and quizzes (fix yours).
- Discuss with others! (and get some sleep)¹⁴

Office Hours during finals

Day	Date	Time
T	5/5	1:30-3:00pm
W	5/6	1:30-3:00pm
Th	5/7	1:30-3:00pm
M	5/11	1:30-3:00pm
F	5/15	1:30-3:00pm

15