Final Exam Review

CS 2308 / CS 5301
Spring 2020
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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

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)

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
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

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

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

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
  - array[index] = *(array + index)
- Dynamic memory allocation
  - new + delete operators
  - allocate new arrays (duplicateArray, etc.)
- Pointers as parameters (call by reference, arrays)
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

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

Unit 5: Linked Lists
- Pointers to Struct: declaration, access (s->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)

Unit 6: Stacks and Queues
- ADT, LIFO and FIFO
- 4 basic operations of each data type:
  pop
  enq
  isEmpty
  push
  deq
  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.
Sample Problems

See the lecture notes titled:
Final Exam Exercises
on the class website (soon)

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)

Office Hours during finals

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