

# CS110 - Principles of Computer Systems

## Midterm Exam

(Total time = 50 minutes, Total Points = 50)

Name: (please print) \_\_\_\_\_

In recognition of and in the spirit of the Stanford University Honor Code, I certify that I will neither give nor receive unpermitted aid on this exam.

Signature: \_\_\_\_\_

This examination is close book and close notes. You may not collaborate in any manner on this exam. You have 50 minutes to complete the exam. Please write your answers on the exam. Note there is one problem per page so the amount of space provided does not necessarily provide an indication of the expected length of the answer. In other words, do not feel compelled to fill every nanoacre of the exam with writing. Before starting, please check to make sure that you have all 9 pages.

Question	Points	Score
1	12	
2	6	
3	8	
4	8	
5	8	
6	8	
Total	50	
Extra	5	

1. (12 points) Recently Apple Computer changed their iPhone Developer License Agreement (an agreement all iPhone applications must abide by) to include the following section:

*3.3.1 - Applications may only use Documented APIs in the manner prescribed by Apple and must not use or call any private APIs. Applications must be originally written in Objective-C, C, C++, or JavaScript as executed by the iPhone OS WebKit engine, and only code written in C, C++, and Objective-C may compile and directly link against the Documented APIs (e.g., Applications that link to Documented APIs through an intermediary translation or compatibility layer or tool are prohibited).*

For each of the following concepts from class, describe how the above section relates to the concept. If there is no obvious relationship simply write none.

- a. Naming and naming conflicts
- b. Interpreters, memory, and communication links
- c. Layers and Layer bypass
- d. Virtualization – Emulation

... more space available on next page (don't feel compelled to use it)....

Space for answering question 1

2. (6 points) Explain the tradeoff between generality and specialization in computer system design. Give an example that illustrates the tradeoff.

3. (8 points) Answer the following two questions about naming systems.
  - a. Recall that name resolution is done within a *naming context*. Describe two ways name resolvers determine the correct naming context to use.
  - b. Is there a relationship between *user-friendly names* and *overloaded names*? If so, explain the relationship.

4. (8 points) Modern operating systems divide a program running in an address space into segments. Common segment types include (1) the code segment, containing the instructions that are executed, (2) the heap segment, used by dynamic memory allocation (e.g. malloc/new), and (3) the stack segment, used to hold the runtime stack of the process. Explain why a process' heap segment can have fragmentation problems while its stack and code segments codes don't.

5. (8 points) Answer the following two-part question.
  - a. Explain why on modern computers we wouldn't want to run a small ( $< 25$  instruction) subroutine using enforced modularity.
  - b. Given an example scenario of where we would want to use enforced modularity on a small subroutine.

6. (8 points) You see the following statement on the CS110 discussion forum:

Although *non-blocking synchronization* doesn't have *deadlock* problems it can have *livelock* problems under high contention.

Does this statement make any sense? Explain your answer.

7. (EXTRA CREDIT 5 points) Restate the Apple license section from Question 1 using concepts from the class to be more understandable to a technical person of what is allowed in an iPhone application.