

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 8 pages.

Question	Points	Score
1	8	
2	7	
3	9	
4	7	
5	7	
6	6	
7	6	
Total	50	

1. (8 points) Naming systems can run into problems when a name's lifetime differs from the object referenced by the name. A name might live longer than the object it refers to, or the object might live longer than the name.
 - (a) Describe a technique used for dealing with this lifetime problem.
 - (b) Which of these two problems (a name living longer than its object or the object living longer than its name) would likely be less harmful in a system?

2. (7 points) When running on a uniprocessor (a machine with a single CPU) a thread tries to acquire a lock and finds some other thread holds it. Is this likely an error? If so, describe why. If not, describe what it means and what should happen when the situation is encountered.

3. (9 points) Assume you went in and changed the condition variable `wait()` method so that it no longer accessed (i.e. released and acquired) the monitor lock. Which of the conditions would occur if existing code tries to use this new condition variable `wait()` implementation:

- (a) Race condition
- (b) Deadlock
- (c) Livelock

For each condition explain your answer.

4. (7 points) Is the resolve function of the Domain Name System (DNS) an example of an *idempotent* service? Justify your answer.

5. (7 points) Would it make sense for a client and service of a client/service architecture to share a lock? Explain your answer.

6. (6 points) Explain why it is more difficult for a programmer to intentionally violate modularity in a system that uses enforced modularity than in a system that uses soft modularity.

7. (6 points) Graphic Processing Units (GPUs) are I/O devices commonly found in modern computers. Unlike most other I/O devices that communicate directly only with the operating system, application programs communicate directly with GPUs. Describe the concept from class that best describes this exceptional behavior.