MCS378 Final Exam

Serial #:

This exam is an open-book, open-notes, individual-work exam. Please write your name only on this page. Do not turn the page until instructed, in order that everyone may have the same time. Then, be sure to look at all problems before deciding which one to do first. Some problems are easier than others, so plan your time accordingly. You have two hours to work.

Do only four of the five problems. If you do any work on all five, you must mark one of them "do not grade." Otherwise I will simply grade the first four.

Write the answer to each problem on the page on which that problem appears. You may use the back of that same sheet if you need additional space. You may also request additional paper.

If any problem has a numerical answer, you are welcome to indicate the arithmetic that needs to be done rather than doing the arithmetic. For example, you could give as your answer $5 \times 12 + 3$ rather than 63. This will not result in any loss of credit.

If you are stuck, I am willing to sell you a hint for some points.

Name: _____

Problem	Page	Possible	Score
1	2	12	
2	3	12	
3	4	12	
4	5	12	
5	6	12	
Total		48	

1. [**12 Points**] A disk driver has requests queued for cylinders 1980, 1900, 1990, and 1000, in that order. For each of the following disk arm scheduling algorithms, indicate the order in which the requests would be processed, and what the total seek time would be. In each case, assume that the disk head is initially at cylinder 1980. The time to do a seek is 1 ms plus .005 ms per cylinder. (For example, to seek from cylinder 10 to cylinder 12 would take 1.01 ms.)

   (a) FCFS

   (b) SSTF

   (c) LOOK (initially headed towards lower-numbered cylinders)

2. [**12 Points**] Consider three variants of a web server:

   (a) A SPED (Single Process Event Driven) server using the `select` system call to check when disk and network operations are complete.

   (b) An AMPED (Asymmetric Multi-Process Event Driven) version of the server, still using `select`.

   (c) A version of the server that sticks with the SPED architecture but uses the new explicit event delivery mechanism proposed by Banga *et al.*

   If the workload involves a small enough amount of data (web pages) that they can all fit in memory, and there is only ever a small number of concurrent client connections, the three variants of the web server will perform approximately the same as each other.

   Now suppose we consider two alternative changes in workload:

   (a) Increase the amount of data beyond what memory can hold, but leave concurrent connections low.

   (b) Substantially increase the number of concurrent connections, but leave the amount of data low.

   One of these two workload changes favors server variant (b) and one favors server variant (c). Explain which and why.

3. [**12 Points**] Explain the difference between an Ethernet hub and an Ethernet switch.

4. [**12 Points**] You have now implemented distributed systems both using socket communications and using a distributed object system (RMI). If you had free choice which to use for a future system, which would you choose? Why? (If your answer is "that depends," tell what it depends on and why.)

5. [**12 Points**] Suppose you are managing a computer system and are worried that your users' passwords may be exposed, for example by shoulder surfing or sniffing. What alternative authentication mechanism could you use instead of conventional passwords, in order to neutralize this threat to system security? What would the disadvantage be?