

Last Name: _____, First Initial: _____

COP 4600 Operating Systems
Exam 3
7 December 2016

Instructions

1. Read all instructions. Failure to follow instructions will result in loss of points.
2. This is a closed-book examination.
3. You are permitted one 8.5 by 11 inch sheet of notes (both sides OK) that you have prepared.
4. You are permitted **45 minutes** to complete this examination.
5. **Do not start** the exam until the proctor has told you to start.
6. **Answer one even and one odd question for a total of two (2) questions, and no more.** All questions are of equal value.
7. **Leave sufficient room in the upper left-hand corner for the staple** and staple your answer sheets in the room you have left.
8. **Put the question number in the top center of each answer page** and label each part of the question answer.
9. Include your last name and page number in the upper right hand corner of each answer page.
10. Show your work.
11. **Start the answer to each question on a new page** (i.e., do **not** put the answer to more than one question on the same page).
12. Use exactly one page of paper (both sides is OK, or two pages front side only) to hold the answer to each question, and please write legibly.
13. **Assemble your answers in numerical order** of the questions when you submit them.
14. Print your family name and first initial in the upper right hand corner of this page, and complete the honor statement affirmation below.

Read and sign the following statement. This page **MUST** be attached to your examination answers and **MUST** be completed to obtain credit for this examination.

On my honor, I have neither given nor received unauthorized aid on this examination.

Signed _____

Printed Name: _____

UFID: _____

1. I/O (answer this or Q3)

Suppose that you want to determine how much benefit there is to arranging your file system using cylinder groups as opposed to just getting a faster disk. Assume your current disk has 120 cylinders and the OS makes no effort to allocate blocks intelligently.

- a. (1) If block accesses are randomly spread over the whole disk, what is the expected amount of head movement per request, if requests are serviced FCFS?
- b. (1) Suppose the OS makes five equal-sized cylinder groups. What is the expected amount of head movement for a request at a random track in the same group?
- c. (3) Now suppose that you find that with five cylinder groups, the next request is in the same group 70% of the time, and in another group (at random) 30% of the time. What is the expected seek time in this case? What can be done by the file system to make such request group locality more likely? Explain.
- d. (2) How would you go about collecting the information on the location of the current request relative to the previous request? How would you measure the effect of using cylinder groups in a real system?
- e. (3) Disk scheduling may be done by accepting a batch of requests at a time and servicing all of them, or accepting requests as they arrive and servicing them according to the scheduling policy. Which do you think is better if the policy is SSF, and which is better if the policy is ELEVATOR? Why?

2. Deadlock (answer this or Q4)

- a. (3) Under what circumstances is the “detect-and-recover” approach to deadlock handling acceptable, and when is it not acceptable?
- b. (4) Give four distinct criteria for selecting a process to preempt when a deadlock has been detected. Give the pros/cons for each criterion.
- c. (3) What approach is used by systems in which deadlocks are not acceptable? Which condition is almost always negated in these? Why?

3. I/O (answer this or Q1)

- a. (6) How does the way in which a visual computer game program (that uses both keystrokes and mouse input) requests input from the keyboard differ from the way in which a command-line oriented program requests input from the keyboard? Include differences in input mode and nature of requests, and driver handling of requests.
- b. (4) How is it that the user can see the characters they are typing while a line-input oriented process (like the shell) only sees the completed line? In this situation, how can holding down the ‘a’ key result in the ‘a’ character being repeated many times per second on the screen? Explain where in the system this response is done and how it may be done.

4. Security (answer this or Q2)

- a. (3) Why is it that the Protection Matrix is almost never implemented directly in practice? How does using ACLs or capabilities make matters better?
- b. (2) What is easy to determine using capabilities but hard to determine with ACLs? Explain.
- c. (2) Why is revocation hard to do with capabilities? Explain.
- d. (3) Why are computer viruses that infect applications more often a problem on personal computers than they are on time-shared systems? Explain.