**CS 414 Assignment 6**
**5 points per answer for 1a-f, 6a-b, 10 points per answer for 3, 4, 6c-d, 15 points for 2, 5 (110 max). Due Wednesday April 26.**

1. Suppose that a disk drive has 5000 cylinders, numbreed 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is

   $$130, 1750, 1022, 1509, 948, 1774, 913, 1470, 86$$

   Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?

   (a) FCFS
   (b) SSTF
   (c) SCAN
   (d) LOOK
   (e) C-SCAN
   (f) C-LOOK

2. Some file systems allow disk storage to be allocated at different levels of granularity. For instance, a file system could allocate 4 KB of disk space as a singe 4-KB block or as eight 512-byte blocks. What kind of applications might exploit this feature to request a larger block size? What kind of applications would probably want a smaller file size? What modifications would have to be made to the free-space management scheme in order to support this feature?

3. Suppose that a file with contents F has two names in the file system, A and B. You delete the file by deleting name B, then create a new file with contents F' and give it this same name, B.

   (a) If A was a symbolic link and B was a true link (e.g. A was a symbolic link to B) and you print A, would you see the original file contents, F, or the modified contents, F' ?
   (b) If A was a true link and B was a symbolic link (e.g. B was a symbolic link to A) and you print A, would you see the original file contents, F, or the modified contents, F' ?
   (c) If A was a true link and B was a true link and you print A, would you see the original file contents, F, or the modified contents, F' ?

4. Suppose that a new generation of disks will use special laser optical access technology with no moving parts. This technology has identical access time for all blocks on the disk no matter where the block is located. Would the file system need to worry about placement of blocks close to inodes or file fragmentation when using such a disk? (In fact a form of this type of disk already exists memory sticks for digital cameras and PDAs are treated like a disk but because the actual technology is just a flash memory, access to the data has the same cost no matter what you access and no matter what the access pattern).

5. Consider a system like PAST/Pastry, where nodes are arranged in a ring, and the data stored on each node is determined by its position on the ring. Suppose that instead of determining node IDs via a secure hash function, we ask nodes to randomly choose their ID from the range $[0, 2^{128}]$ at signon. What would be an important security consequence of this change? Assume that an attacker knows the hashes of files of interest to him. Suppose that we do hash node id's, but a node can pick its own ID within some large set. Could this also pose a problem?

6. We learned about dynamically linked libraries in class.

   (a) List several advantages of using dynamic libraries

(b) We learned that each program must make its own copy of any data segments associated with a DLL, but that all programs using a DLL share the code. Explain the difference between a data segment and a code segment in just a few words (not an essay!) and then explain briefly why we need to create private copies for one, but not the other.

(c) While developing a new game program, suppose that you discover that a commonly used DLL has a bug. You track down the source file, fix the bug, and recompile the library. Now your game program begins to work perfectly. Yet other users are suddenly complaining that many of there programs have begun to crash! Why might fixing a bug in a DLL cause problems? Would the same issue have arisen if we were using traditional statically linked libraries? Explain.

(d) A motivation for the DLL concept was to reduce the total virtual memory size. Remind us of how DLLs can give this benefit. Now describe a situation in which moving to DLLs would actually cause the virtual memory in use to rise, presumably hurting performance relative to a solution that did not have DLLs. You can assume that the library we are thinking of is the formatted I/O library for a programming language like C or C++ if it helps you focus on a specific scenario in answering this question.