CSE 121 HW 3
Due March 4th 2010

1. Lottery Schedule
(a) What is the main problem with Lottery Scheduler? Explain why it is a problem.

(b) At a high level, as a mechanism how does lottery scheduling provide modular resource management (allow different modules to control their own internal scheduling)? Why can’t the Unix scheduler provide a similar kind of management?

(c) We have two threads A and B that have the same amount of base tickets say 400 each. The time quantum each thread gets when running is 100ms and both threads need to run for 120 ms. Is there any way for thread A to increase its chance of finishing before thread B? (Hint: Think about compensation tickets)

2. Mach and L3/L4
(a) An unusual feature of Mach is the blending of memory and interprocess-communication features, Mach allows each to be used in the implementation of the other. Provide at least two advantages that Mach gains from the blend of memory and IPC.

(b) The L3 kernel only implements 3 functions for address space: mapping, flushing and granting. Mapping and flushing are required to implement memory managers and pages on top of the u-kernel but is granting also required for a memory manager to work? Explain.

(c) Imagine we have a HTTP web server running in user space. For Mach and L3, consider the path a network packet containing an HTTP request takes as it travels from the network interface card to a Web server process running at user level. Assume that the web server process is separated from the Linux/BSD operating system running in user space. Describe in high level language for example, for Linux: Linux kernel -> [interrupt] -> web server process.

3. Nooks
(a) Give one example of a type of bug that Nooks does not deal with. Why does it not deal with it?

(b) Louis Reasoner is working on his computer that runs Nooks. He decides to print a classified document from his computer to the printer in the room next door. Louis finds it suspicious that it takes unusually longer for him to receive a completed print job notification for document size. Concerned about someone stealing pages of his document he runs to the printer and finds that all his pages are there. Is Louis safe from anyone stealing a page of his document? Assume that someone was hovering over the printer while it was printing and their only means of stealing the document is actually taking a printed page.

4. Exokernel
(a) The Exokernel tries to separate protection from management, meaning they protect resources but delegate management to applications. Give an example of a resource and how the exokernel applies this principle to the resource. (hint: provide a resource and state how the application manages it and how the exokernel protects it)

(b) List two problems that will dissuade Microsoft from creating an exokernel operating
system for wide spread adoption. Explain (hint: think about 3rd party companies developing for an exokernel system)