

# Operating Systems PhD Qual

## Spring, 2005

Do all problems.

1. Explain the concepts of "paged virtual memory" and "swapping." How do they differ? How might they be used together?
2. One technique for ensuring mutual exclusion is to disable interrupts so that no re-scheduling can occur during a critical section. Explain why this technique may be useful within an operating system but is not a suitable synchronization technique among processes or within a multi-threaded process.
3. Explain what a "certificate" is and what role it plays in digital signatures.
4. Suppose that a floppy disk has 40 cylinders and that a seek takes 6 milliseconds per cylinder moved. If no attempt is made to put the blocks of a file close together, two blocks that are logically consecutive will be physically separate by about 13 cylinders, on average. (That is, one will be about 1/3rd of the way in and the other will be about 2/3rds of the way in.) Suppose that if the operating system makes an attempt to cluster related blocks, then the mean interblock distance can be reduced to 2 cylinders. How long does it take to read a 100-block file in both cases, assuming a rotational latency of 100 milliseconds and a transfer time of 25 milliseconds per block? Ignore all factors besides the time to access the 100 blocks.