CS 4760	**Operating Systems**	Test 1
Name:	Spring 2014	Max Pts: 50

Important: This is an open book test. You can use any books, notes, or paper but no electronic device. *Do not log into the computer during the test, or use any electronic or communications device. Change your cell phones to silent mode.* Any calculations and rough work can be done on the back side of the test pages. If there is a syntax error in any program segment, just write it down and you will get full credit for the problem. You will lose five points for not writing your name.

1. [10 pt] A machine uses a simulation of DMA to transfer data between CPU and disk drive. However, the CPU controls all the transfers and is held up while the data transfer takes place. The CPU has been benchmarked to work at 3GHz, with an average instruction requiring 1.5 clock cycles. The disk rotation speed is 7200 RPM. If our code has to perform one data transfer every 10 seconds, what is the percentage degradation in CPU performance? Ignore the actual transfer time from computation.

2. [6 pt] How can you ensure that the machine language instructions are executed atomically?

3. [6 pt] What are IRQs? What is the difference between a *short* and a *long* IRQ?

4. [12 pt] Show that the bakery algorithm solves the critical section problem correctly. Comment on the fact that it allows two processes to choose the same `number`.

5. [6 pt] How do you achieve the effect described by the following statement: "Program changes but process remains." Specify a system call used to achieve this.

6. [10 pt] Assume that the machine you are working on does not have a `test_and_set` instruction. However, it does have an indivisible `swap` instruction. This indivisible `swap` instruction swaps the contents of two memory locations atomically. How can you use this to solve the critical section problem. Show with the template for the critical section problem.