CS 4760	**Operating Systems**	Test 1
Name:	Spring 2012	Max Pts: 44

Important: This is an open book test. You can use any books, notes, or paper, but not exchange anything with other students. You are not allowed to use any electronic/communication devices, including a calculator and e-books. *Do not log into the computer during the test. Switch off your cell phones. Any device with an* ON-OFF *switch should have its switch in the* OFF *position.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [6 pt] How can the task in the following statement be achieved? "Several processes can execute the same program concurrently, while the same process can execute several programs sequentially." Explain with an example.

2. [6 pt] Give an example each of a synchronous and asynchronous interrupt.

3. [10 pt] Consider a memory system with the following parameters:

Access time in cache	100ns	Cost of cache	0.01c/bit
Access time in main memory	1,200ns	Cost of main memory	0.001c/bit

(a) What is the cost of 1 megabyte of main memory?

(b) What is the cost of 1 megabyte of main memory using cache memory technology?

(c) If the effective acess time is 10% greater than the cache access time, what is the hit ratio H?

4. [6 pt] What is the effect of a thundering herd on the performance of an operating system?

5. [6 pt] Explain the difference between semaphore wait and condition wait. Also explain the difference between semaphore signal and condition signal.

6. [10 pt] Linux kernel provides a C function named `atomic_sub_and_test)i,v)`. This function takes advantage of the underlying hardware atomic instructions. The semantics of the function can be described as: *Subtract* `i` *from* `*v` *and return 1 if the result is zero; 0 otherwise.* Write the code using this function to solve the critical section problem. Show proper initialization of variables.