CS 4760	**Operating Systems**	**Test 2**
Name:	Fall 2007	Max Pts: 51

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. Switch off your cell phones*. 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. [6 pt] Explain the difference between synchronous and asynchronous message passing between processes through an example.

2. [6 pt] How does a kernel know the identification of processes that are waiting on a resource? How will it know when a resource is available to be allocated (just describe the mechanism that will allow the kernel to know the resource availability as it becomes available).

3. [4 pt] Does the Unix scheduler work as autonomous scheduler or shared scheduler?

4. [6 pt] It is stated that deadlocks can be prevented by eliminating circular wait condition. One way to achieve that was to impose a total order on resources. Can the same effect be achieved by imposing a partial order? Explain your answer.

5. [4 pt] Explain the difference between a heap manager and a virtual memory manager.

6. [10 pt] Assume a system with four resource types, $C = \langle 7, 5, 9, 8 \rangle$ (this is the total number of resources in the system, and not what is currently available), and the maximum claim table shown below.

Process	R_0	R_1	R_2	R_3
p_0	5	1	4	1
p_1	5	2	3	4
p_2	2	1	1	2
p_3	1	4	4	3
p_4	0	2	3	1

The resource allocator is considering allocating resources according to the following table:

Process	R_0	R_1	R_2	R_3
p_0	2	1	2	1
p_1	3	1	3	2
p_2	1	1	0	2
p_3	1	1	2	3
p_4	0	1	2	0

Run the safety algorithm on this system to determine if this state is safe. If it is safe, give the sequence in which processes can be run. If it is unsafe, enumerate the processes that may get involved in a deadlock.

7. [15pt] Assume that you have the following jobs to be executed with one processor:

Process	Burst time	Arrival time
p_0	7	2
p_1	6	3
p_2	5	1
p_3	9	3
p_4	6	0

Give the average wait time and average turnaround time for each process using the following algorithms. Is the CPU idle at any time in the given algorithms?

(a) First in first out

(b) Shortest job next (no preemption)

(c) Shortest remaining time next

(d) Round robin, with a quantum of 2

(e) Round robin, with a quantum of 4 plus context switch time of 1