CS 4760	**Operating Systems**	Test 2
Name:	Winter 2004	Max Pts: 61

Important: This is an open book test. You can use any books, notes, or paper. *You are not allowed to use any communications device. Do not log into the computer during the test.* 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. [9 pt] Most round-robin schedulers use a fixed size quantum. Give an argument in favor of a small quantum. Now give an argument in favor of a large quantum. Do not forget the overhead for context switch. What type of quantum is good for a system such as admiral if it followed a pure round-robin schedule? Assume that admiral handles mostly the student processes and a few processes involving professors' research.

2. [6 pt] Three processes share four resource units from the same resource class that can be reserved and released only one at a time. This can be done in any order, that is, we do not have total order imposed on requests. Each process needs a maximum of two units. Can we have a deadlock in the system? Explain your answer.

3. [15 pt] Assume you have the following jobs to execute with one processor:

Process	Burst time	Arrival time
p_0	8	0
p_1	4	3
p_2	8	3
p_3	3	9
p_4	6	13

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 4

(e) Round robin, with a quantum of 5 plus context switch time of 1

4. [7+8 pt] Assume a system with four resource types, $C = \langle 6, 7, 12, 12 \rangle$ (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	0	0	1	2
p_1	2	7	5	0
p_2	6	6	5	6
p_3	4	3	5	6
p_4	0	6	5	2

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

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

(a) Draw a process resource graph corresponding to this snapshot of the system.

(b) 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.

5. [16 pt] Consider the following processes. Show the memory allocation for them at time 10, 20, 30, 40, 50, 60, 70, and 80 using first fit allocation. You have 1MB total memory available out of which 2KB is allocated permanently for operating system. Operating system resides in high memory area. Repeat the problem with best fit allocation.

Process	Arrival time	Burst time	Memory Requirement
p_0	0	12	220KB
p_1	8	15	530KB
p_2	11	16	760KB
p_3	13	12	90KB
p_4	19	10	660KB
p_5	27	18	520KB