CS 4760	**Operating Systems**	**Test 2**
Name:	Fall 2011	Max Pts: 53

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] Distinguish between process context and process mode.

2. [6 pt] What is a blocked process? What is a deadlocked process? How are the concepts of the two types of process related (Which one is required for the other)?

3. [6 pt] Explain the difference between internal and external fragmentation. What type of fragmentation do you get with a paging system, a segmenting system, and one based on paged segmentation?

4. [10 pt] Consider a system with the following set of processes and states:

$$P = \{p_0, p_1, p_2\},\ S = \{s_0, s_1, s_2, s_3\}$$

State changes due to processes are:

$$\begin{array}{lll} p_0(s_0) = \Omega & p_1(s_0) = \{s_1, s_2\} & p_2(s_0) = \{s_1, s_2\} \\ p_0(s_1) = \{s_3\} & p_1(s_1) = \{s_2\} & p_2(s_1) = \Omega \\ p_0(s_2) = \Omega & p_1(s_2) = \{s_0, s_1\} & p_2(s_2) = \Omega \\ p_0(s_3) = \{s_1\} & p_1(s_3) = \Omega & p_2(s_3) = \{s_0, s_2\} \end{array}$$

Draw the corresponding state change diagram. Is the system safe? Is it deadlocked? Is there a knot in the system?

5. [15 pt] Assume you have the following jobs to execute with one processor:

Process	Burst time	Arrival time
p_0	11	0
p_1	5	2
p_2	6	3
p_3	8	4
p_4	4	6

Give the average wait time for this set of processes using the following algorithms.

(a) First in first out

(b) Shortest job next (non-preemptive)

(c) Shortest remaining time next (pre-emptive)

(d) Round robin, with a quantum of 3

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

6. [10 pt] You have a physical memory of 64MB, starting at address 0. Your operating system requires at least 10MB all the time. Consider the arrival of processes as follows:

Process	Burst time	Arrival time	Memory needed
p_0	14	0	28MB
p_1	10	3	29MB
p_2	11	6	18MB
p_3	9	7	7MB
p_4	13	8	11MB
p_5	28	9	7MB
p_6	29	17	14MB
p_7	11	23	29MB

Show the layout of memory, using best-fit algorithm, at times 10, 20, 30, 40, and 50.