CS 4760	**Operating Systems**	Test 3
Name:	Spring 2011	Max Pts: 52

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] An engineer suggested to me that he wants to conserve memory and optimize the code at the same time by packing a large amount of data in as little space as possible. In his scenario, the data is integers in the range 0 to 8000. So, data can be organized as 13 bits elements in an array and the array can be packed by treating the memory as a continuous stream of bit elements where each element is at 13-bit boundary. The memory is accessed as 32-bit words. Of course, some elements will get split across word boundaries. The engineer wants to access the data by bit shift operators as needed after reaching the word that contains our element. Can you see any problem with this approach in terms of execution speed?

2. [6 pt] What is the difference between a block-oriented device and a stream-oriented device? Do you have to take care of their device drivers in a special way? Give at least one example of each.

3. [6 pt] What are the typical operations that may be performed on a directory?

4. [6pt] Consider a machine with disk blocks of 2K bytes. You have a new disk of size 1TB. What is the theoretical maximum file size possible using the UFS scheme of 12 direct blocks, 1 single indirect block, 1 double indirect block, and 1 triple indirect block in the inode table?

5. [10 pt] Consider the following scenario for some processes on an embedded system that has 1M of user memory available.

Process	Memory Required	Arrival Time	Burst Time
p0	900K	6	7
p1	400K	1	4
p2	100K	8	9
p3	900K	7	3
p4	100K	6	9
p5	500K	3	8

Assume that the system picks up processes from the job queue based on what is available and can be fit in. In case of a tie, system arbitrates by selecting the process with a smaller burst time requirement. Show the memory layout using first-fit scheme and best-fit scheme at times 0, 10, 20, and 30.

6. [18 pt] Consider a disk with 256 cylinders, indexed from 0 to 255, with 0 being the innermost and 255 being the outermost cylinder. The system receives disk requests on the following tracks in the specified order

88, 42, 106, 7, 92, 44, 45, 76, 67

The head is currently on cylinder 103, and is moving towards outer cylinder. Give the total number of tracks traversed for the given requests using each of the following algorithms.

(a) FCFS scheduling

(b) SSTF scheduling

(c) SCAN scheduling

(d) C-SCAN scheduling, servicing requests as head moves inwards

(e) LOOK scheduling

(f) C-LOOK scheduling, servicing requests as head moves outwards