CS 4760	**Operating Systems**	Test 3
Name:	Spring 2019	Max Pts: 56

Important: This is an open book test. You can use any books, notes, or paper. *Do not use any electronic or communications device. Change your cell phones to silent mode*. 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. Please write legibly; if I cannot read what you wrote, I'll give you a zero. The test is 75 minutes long. You will lose five points for not writing your name.

1. [6 pt] What method/technique is used in the Linux kernel to prevent deadlocks? Just name the technique.

2. [6 pt] Why is memory management important in an OS from the perspective of security?

3. [6 pt] When creating reference strings to evaluate page replacement algorithms, why do we compress the consecutive references to the same page number into a single reference?

4. [6 pt] I have a directory named `fubar` in my `$HOME`. I have read and write permission on this directory. However, when I try to `cd` into `$HOME/fubar`, I get a message saying `Permission denied`. What could be wrong?

5. [6 pt] Which of the disk scheduling algorithms leads to an effective deadlock?

6. [10 pt] A minicomputer uses the first-fit system for memory management. Initially, it has one block of 256KB at address 0. The requests come in the following order:

Arrival time	Burst time	Memory needed
3	10	182
6	4	94
6	4	106
13	1	150
20	14	89
24	10	10
27	12	98
35	10	46

How many blocks are left at times 3, 9, 18, 25, 29, and 37, and what are their size and address?

7. [4+6 pt] I have a floppy disk with 1.44MB [unformatted] capacity. The data blocks are 512 bytes each.

   (a) The OS keeps track of free space by using a bit vector approach. What is the size of the bit vector for this floppy? If the OS stores the bit vector on the floppy for recovery, how many blocks are left over to be used to store data.

   (b) Now, consider that the same floppy is formatted using UFS, with an empty boot block of size 1 block. Consider 1 block to be allocated for super block. Let each inode require 1024 bytes. What can be the maximum formatted capacity of the floppy? What is the maximum file size that can be stored on this floppy if the system uses 12 direct blocks, 1 single indirect block, and 1 double indirect block?

8. [6 pt] Unix and Windows both treat files as a stream of bytes. However, in a number of applications, we need to access random records in files without having to read the files sequentially. How will you accomplish this in Unix or Windows. Be specific o the point of giving me the function names required.