CS 4760	**Operating Systems**	Test 3
Name:	Fall 2015	Max Pts: 46

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. 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. You will lose five points for not writing your name.

1. [8 pt] The most simplified view of process states is *Ready*, *Running*, and *Wait*. Assuming a process is in the *Running* state, answer the following questions and explain your answer:

   (a) Will the process change state if it incurs a page fault? If so, to what state will it change?

   (b) Will the process change state if an address reference is resolved in the page table? If so, to what state will it change?

2. [10 pt] Consider the page table shown below for a system with 12-bit virtual and physical addresses and with 256-byte pages. The list of free page frames is D, E, F (that is D is at the head of the list, E is second, and F is last).

Page	Page Frame
0	–
1	2
2	C
3	A
4	–
5	4
6	3
7	–
8	B
9	0

Convert the following virtual addresses to their equivalent physical addresses in hexadecimal. All numbers are given in hexadecimal. (A dash for the page frame indicates that the page is not in memory; so you may have to bring the page in before computing its physical address.)

(a) 0X9EF

(b) 0X111

(c) 0X700

(d) 0X0FF

3. [6 pt] Some systems keep track of the type of a file, while others leave it to the user, and still others do not implement multiple file types. Which system is better from user perspective? From OS perspective?

4. [6 pt] Consider a file system that uses inodes to represent files. Disk blocks are 8KB in size, a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, as well as single, double, and triple indirect disk block. What is the maximum size of a file that can be stored in this file system?

5. [6 pt] One of the problems with linked list allocation of disk blocks is that the block storage is no longer a power of 2. Why is it important to have the block storage to be a power of 2?

6. [10 pt] Consider a system that has 8MB memory available. The memory requests are satisfied by allocating frames of size 1K bytes. The requests for allocation and deallocation come from different processes in the following order:

```
P0: m00 = malloc ( 28K );
P8: m30 = malloc ( 5K );
P1: m10 = malloc ( 31K );
P1: m12 = malloc ( 23K );
P1: free ( m10 );
P3: m06 = malloc ( 11K );
P8: free ( m30 );
Pl: m05 = malloc ( 1K );
P3: free ( m06 );
P5: m20 = malloc ( 23K );
P0: m08 = malloc ( 27K );
```

Use the buddy algorithm to show the memory layout after each request.