COP 4600 – Introduction To Operating Systems – Summer 2011

Homework #2 – 120 points – DUE DATE: Tuesday July 12th

1) (15 pts – 2 pts each) A process has associated with it the following table. For each logical address shown indicate if the address is legal or illegal. If it is a legal address, compute the corresponding physical address. All addresses are in the form <p, d>, where p = page number and d = displacement. Assume each page/frame is 1000 bytes in size.

Page #	Frame #
0	4
1	12
2	22
3	7
4	15
5	24
6	14

Logical Address	Is It A Legal Address?	Physical Address
<0, 444>		
<2, 2100>		
<6, 0>		
<5, 800>		
<1, 113>		
<3, 200>		
<4,1000>		

2) (15 pts – 2 pts each) Using the same page table as in problem 1. What happens when the size of the page is increased to 4000 bytes per page?

Logical Address	Is It A Legal Address?	Physical Address
<0, 444>		
<2, 2100>		
<6, 0>		
<5, 800>		
<1, 113>		
<3, 200>		
<4,1000>		

3) (25 pts – 5 pts each) Consider a simple paging system with the following parameters: physical memory = 2^{64} bytes, page size = 2^{10} bytes, an application/program with 2^{16} pages of logical address space.

(a) How many bits are required for a logical address?
(b) How many bytes are in 1 page frame?
(c) How many of the bits in a physical address are used to specify the page/frame?
(d) How many entries will be in the page table?
(e) How many bits are required in each page table entry (assume the presence of a valid/invalid bit).

4) (50 pts – 10pts each)Assume that a dynamic partitioning scheme is being used, and the diagram below illustrates the configuration of the memory at some point in time. The shaded areas are allocated blocks; the white blocks are free blocks.

20 MB	20 MB	40 MB	60 MB	20 MB	10 MB	60 MB	40 MB	20 MB	30 MB	40 MB	40 MB

The next three memory requests are for 40MB, 20MB, and 10MB, respectively. Give the starting memory address for each of the three new requests using the following allocation algorithms:

(a) First-fit
(b) Best-fit (smallest remaining fragment)
(c) Next-fit (assume the most recently added block was at location 0)
(d) Next-fit (assume the most recently added block was at location 160)
(e) Worst-fit (largest remaining fragment)

5) (15 pts – 3pts each) Consider a simple segmentation system that has the following segment table:

Segment	Starting Address	Length (bytes)
0	234	100
1	668	568
2	1890	1300
3	345	250

For each of the following logical addresses, determine the physical address, or if the address is invalid:

Logical Address	Is It A Legal Address?	Physical Address
<0, 444>		
<2, 1100>		
<3, 200>		
<5, 800>		
<1, 513>		