COP 4600 – Introduction To Operating Systems – Summer 2014

Homework #2 – 140 points

Due: **Tuesday June 24th (by 11:59 pm WebCourses time)**. NO LATE ASSIGNMENTS ACCEPTED

Answer each of the following questions completely. Make sure that your answers are neatly written and very readable. Points will be deducted if your assignment is not presented in a neat format.

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. If it is, compute the physical address. Addresses are in the form <p, d>. Assume each page/frame is 1000 bytes in size.

Page #	Frame #
0	2
1	8
2	12
3	15
4	3
5	20
6	7

Logical Address	Is It A Legal Address?	Physical Address
<0, 454>		
<2, 2310>		
<6, 0>		
<5, 820>		
<1, 113>		
<3, 220>		
<4,4096>		

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, 454>		
<2, 2310>		
<6, 0>		
<5, 820>		
<1, 113>		
<3, 220>		
<4,4096>		

3) (15 pts – 3 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) (40 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.

initial													
	30 MB	40 MB	20 MB	50 MB	50 MB	10 MB	40 MB	60 MB	10 MB	60 MB	20 MB	30 MB	30 MB
0	30	70	90	140	190	200	240	300	310	370	390	420	450

The next three memory requests are for 40MB, 20MB, and 10MB, respectively. Assuming that no memory compaction occurs, give the starting memory address for each of the three new requests and redraw the final memory configuration using the following allocation algorithms:

(a) First-fit
(b) Best-fit (leave smallest remaining fragment)
(c) Next-fit (assume the pointer is at address 240)
(d) Worst-fit (leaves largest remaining fragment)

5) (40 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.

initial													
	30 MB	40 MB	20 MB	50 MB	50 MB	10 MB	40 MB	60 MB	10 MB	60 MB	20 MB	30 MB	30 MB
0	30	70	90	140	190	200	240	300	310	370	390	420	450

Give the starting memory address for each of the allocation requests and redraw the final memory configuration using the following allocation algorithms:

(a) First-fit: The next seven memory requests are: (1) allocate/request a 40MB block, (2) deallocate/free the 40MB block at address 200, (3) allocate/request a 70MB block, (4) deallocate/free the 50MB block at address 100, (5) allocate/request a 80MB bloc, (6) deallocate/free the 60 MB block at address 170, and (7) allocate/request a 30 MB block.

(b) Best-fit (leave smallest remaining fragment): The next seven memory requests are: (1) allocate/request a 40MB block, (2) deallocate/free the 40MB block at address 200, (3) allocate/request a 70MB block, (4) deallocate/free the 50MB block at address 100, (5) allocate/request a 80MB bloc, (6) deallocate/free the 60 MB block at address 170, and (7) allocate/request a 30 MB block.

(c) Next-fit (assume the most recently added block was at address 200 – pointer advances to end of most recently added request block or to the start of the free space after compaction/coalescing occurs): The next six memory requests are: (1) allocate/request a 40MB block, (2) deallocate/free the 40MB block at address 200, (3) allocate/request a 70MB block, (4) deallocate/free the 50MB block at address 60, (5) deallocate/free 20 MB at address 230, and (6) allocate/request a 30 MB block.

(d) Worst-fit (leaves largest remaining fragment): The next seven memory requests are: (1) allocate/request a 10MB block, (2) allocate/request 20 MB block, (3) allocate/request a 30MB block, (4) deallocate/free the 40MB block at address 30, (5) deallocate/free the 10 MB block at address 190, and (7) allocate/request a 40 MB block.

6) (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>		