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Operating Systems
Due 02/24/16

Homework #5

Question 1.

a) Best fit

For best fit, the smallest available free region is allocated. In this case, that region is the free block with size 100 bytes.

840	body	
836	next = NULL	
832	size = 1208	
532	body	p2
528	magic	
524	size = 300	
474	body	p3
470	magic	
466	size = 50	
424	body	
420	next = 832	
416	size = 42	
216	body	p1
212	magic	
208	size = 200	
8	body	
4	next = 416	
0	size = 200	head

b) Worst fit

For worst fit, the largest available free region is allocated. In this case, that region is the free block with size 1208 bytes.

1998	body	p3
1994	magic	
1990	size = 50	
840	body	
836	next = NULL	
832	size = 1150	
532	body	p2
528	magic	
524	size = 300	
424	body	
420	next = 832	
416	size = 100	
216	body	p1
212	magic	
208	size = 200	
8	body	
4	next = 416	
0	size = 200	head

c) First fit

For first fit, the first available free region is allocated, starting from the free list head. In this case, that region is the free block starting at head.

840	body	
836	next = NULL	
832	size = 1208	
532	body	p2
528	magic	
524	size = 300	
424	body	
420	next = 832	
416	size = 100	
216	body	p1
212	magic	
208	size = 200	
158	body	p3
154	magic	
150	size = 50	
8	body	
4	next = 416	
0	size = 142	head

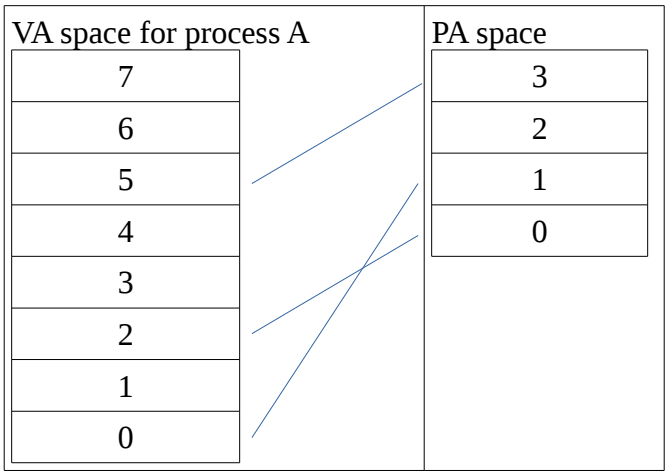
Question 2.

page size: 256 bytes
virtual memory space: 8 pages
physical memory space: 4 frames

Process A page table

Page	**Frame**
0	1
2	0
5	3

a) Plot a diagram representing the page table for process A. Write the virtual address space on the left, and the physical on the right. Number the pages and frames, and draw arrows that connect pages with their associated frames.



b) How many bits are used to represent a VA? How many for a PA? How many for the page offset?

bits for VA = $\log_2$(256 bytes per page * 8 pages) = $\log_2$(2048) = 11
bits for PA = $\log_2$(256 bytes per frame * 4 frames) = $\log_2$(1024) = 10
bits for page offset = $\log_2$(256 bytes per page) = 8

c) Translate the following VAs into PAs: 418, 0, 581, 460

1) VA = $418_{10} = 00110100010_2$
VPN = $001_2 = 1_{10}$
PFN = unmapped

2) VA = $0_{10} = 0_2$
VPN = 0
PFN = $1_{10} = 01_2$
offset = 00000000_2
PA = $0100000000_2 = 256_{10}$

3) VA = $581_{10} = 01001000101_2$
VPN = $010_2 = 2_{10}$
PFN = $0 = 00_2$
offset = 01000101_2
PA = $0001000101_2 = 69_{10}$

4) VA = $460_{10} = 00111001100_2$
VPN = $001_2 = 1_{10}$
PFN = unmapped