CIS 520 - Operating Systems I – Homework #3

Due: Monday, Oct. 28th, by 11:59 pm, upload via K-State OnLine

1. Consider the following page reference string: 1,2,3,4,2,3,5,3,6,5,5,4,2,4,5. How many page faults would result for the following replacement algorithms assuming two, three, four, five, or six frames? Remember that all frames are initially empty, so the first time a page is loaded will cause a fault.

Algorithm	2 Frames	3 Frames	4 Frames	5 Frames	6 Frames
LRU					
FIFO					
Optimal					

2. You have devised a new page-replacement algorithm that you think may be optimal. In some contorted test cases, Belady's anomaly occurs. Is the new algorithm optimal? Explain your answer.

3. What is the copy-on-write feature, and under what circumstances is it beneficial to use this feature? What hardware support is required to implement this feature?

4. Consider the page table for a system with 12-bit virtual and physical addresses, and 256-byte pages. The list of free page frames is D, E,8, F (that is, D is at the head of the free list, E is second, 8 is third, and F is last).

Page	**Page Frame**
0	9
1	2
2	C
3	A
4	-
5	4
6	3
7	-
8	B
9	0
A	-
B	5
C	1
D	7
E	6
F	0

Convert the following virtual addresses to their equivalent physical addresses in hexadecimal. All numbers are given in hexadecimal. (A dash for a page frame indicates the page is not in memory; i.e., the Valid/Invalid bit is set to Invalid).

- 8FF → _____
- 111 → _____
- 700 → _____
- BFF → _____

Finally, show the resulting updates to the page table above after the preceding addresses are referenced causing some pages to be loaded.