COMP 304- Operating Systems: Assignment 3

Due: May 21st, Final Exam Time

Notes: This is an individual assignment. This is an individual assignment. No late assignment will be accepted. You are required submit your answers through blackboard. A scanned copy is acceptable however make sure the copy is readable. Please submit your printed/hard copy to me or TAs at final exam time or to the mailboxes designated for the OS course. This assignment is worth 3% of your total grade.

Problem 1

(9 points) You are given 5 memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order). How would you place the process of 212 KB, 417 KB, 112 KB, and 426 KB (in order) by using the first-fit, best-fit, and worst-fit algorithms? Which of these algorithms has the most efficient memory usage? Show your work.

Problem 2

(3+4 points) A system with 30-bit logical (virtual) address uses a two-level page table. Logical addresses are split into an 8-bit top-level page table field, a 12-bit second-level page table field, and an offset.
What is the size of a page in this system (assume that the size of a memory location is 1 Byte)? How many pages are there in the address space? Explain the reason.

Problem 3

(9+9 points) Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for the page replacement algorithms: LRU, FIFO, Optimal in the following cases? Explain your answer. Remember all frames are initially empty, so your first unique pages will all cost one fault each.
a) 5 frames are allocated for the process
b) 6 frames are allocated for the process

Problem 4

(6 points) Consider a system that uses pure demand paging to manage memory. Describe the page fault rate (a) when a process first starts execution, (b) once the working set for a process is loaded into memory, (c) when a process changes its locality and its new working set size is larger than the size of free memory.