

CSSE 132 – Introduction to Systems Programming
Rose-Hulman Institute of Technology

Homework 3

Name (Print): _____ RHIT Username: _____

Put your answers in the spaces reserved below the questions. **Do not** write your answers on **separate sheets of paper**.

1. (8 points) In this class, we compared the following types of memory: SRAM, DRAM, Flash Memory (and SSD), Hard Disks.
 - 1.1 In a modern computer, we usually use (faster) SRAM for CPU registers and (slower) DRAM for main memory. Why don't we use the faster SRAM for main memory as well? Please explain your reasoning.
 - 1.2 Given the significantly faster speed of DRAM over SSD, can we replace the existing SSD with DRAM for data storage? Explain your reasoning.
2. (10 points) Consider a system with a cache for its hard disk. It takes 20ms to access the disk and 150ns to access the disk's cache. Compute the average access time for each miss rate. Be sure to show all your work.
 - 2.1 Cache miss rate is 0.1%.
 - 2.2 Cache miss rate is 0.0001%.

When writing code, make sure you document it well with comments. This is an individual assignment. Be sure your name is in any files you edit when you submit your work.

Before you begin: On your Linux, pull changes to your Git repository.

NOTE: This assignment involves both Assembly programming and C programming. Be aware that the commands to compile and run C and Assembly code are DIFFERENT.

3. On your Linux, complete the ARM assembly functions in the **problems.s** files in the **homework3** subdirectory. The comments tell you what needs to be completed.
 - Use `make test_asm` to compile the code
 - Use `./test_asm` to run and test your code
4. On your Linux, complete these C functions in the **problems.c** files in the **homework3** subdirectory. The comments tell you what needs to be completed.
 - Use `make test` to compile the code
 - Use `./test` to run and test your code

When finished, submit your modified problems.s and problems.c to **Gradescope**.