

## Operating Systems & C – Fall 2020 - SWU

# Exam Hand-in

This is the hand-in for the exam for the OS and C, fall 2020, for SWU students. You will get your grade based on your written answers to the questions below.

This hand-in exam is composed of four questions, with equal weight. Each question contains several sub-questions. The first three questions concern the assignments. Note that there are two versions of Question 2, one for Attack Lab, the other for Perf Lab. You should only answer one version of Question 2, not both. The fourth question concerns concepts and techniques introduced in class.

### Question 1 (25%): Data Lab

- A. Describe your implementation of *logicalNeg(x)*
- B. Consider *howManyOnes(x)*, a function that counts the number of 1s set in a given char *x*. Describe the implementation of this function. Does your solution involve a form of parallel processing? Explain your answer.

### Question 2 (25%):

Attack Lab	Perf Lab
<ul style="list-style-type: none"><li>A. What is a stack frame? Give a detailed example (including addresses and stack contents) based on your assignment. How does the requirement of a 16B aligned stack impact your solution?</li><li>B. What is a gadget? Describe an example of how you use one in your code.</li></ul>	<ul style="list-style-type: none"><li>A. What are the benefits of loop unrolling? Give an example based on your assignment.</li><li>B. What is SIMD processing? Explain whether and how your solution benefits from SIMD (and if not, why not)?</li></ul>

### Question 3 (25%): Malloc Lab

- A. Describe in detail how you check the consistency of the heap.
- B. What is pointer arithmetic? Describe how you use it in your version of `mm.c`

### Question 4 (25%): Topics from the class

- A. What is a race condition? Give an example of how it can be prevented.
- B. What is a socket?
- C. What happens when the CPU executes a store instruction?
- D. What happens when a program writes to a file?