CPSC 424/524 Fall 2018
Mid-Term Exam Sample Questions

Part I: Sample short-answer questions:

1. Explain the difference between Amdahl's Law and Gustafson's Law.

2. At a high level and in the context of the x86 processor architectures discussed in class, explain what SIMD operations are and why they can sometimes improve performance.

3. Discuss why memory caches are important to performance.

4. Suppose a program has a part at the beginning that is serial (must be executed by only one processor) and takes 3 seconds. Also, suppose there is a part at the end of the program that is serial and takes 4 seconds. Between these two parts, the program can be divided into 5 equal parts that can be executed simultaneously and that each take 16 seconds. What is maximum speed-up according to Amdahl's law?

5. Explain the differences between mutex locks and semaphores.

6. Is the following Slurm command valid? If so, what does it do? If not, what's wrong with it?

```
srun --pty -c 5 -t 15:00 -p cpsc424 bash
```

7. Explain the difference between private, firstprivate, lastprivate, and threadprivate in OpenMP.

8. Explain the difference between static and dynamic schedule clauses in OpenMP.

9. Give a simple example of a reduction clause in OpenMP, and explain what it does.

10. Given an OpenMP program fragment, you may be asked questions such as: "Does it work? If not, fix it."; "Is it efficient? If not, improve it."; and the like.

Part II: Programming Exercise:

You should expect this to be a short OpenMP programming exercise for a simple problem (e.g., add a bunch of numbers). You'll be given a working serial program or fragment and asked to parallelize it using OpenMP pragmas and possibly making some small modifications to the serial algorithm. While syntax will matter here, you'll be provided with an OpenMP reference card. In connection with the program, you might be asked some questions about performance issues for it. Expect the programming exercise to be worth approximately 30-40% of the entire exam.