

CSCI-UA.0480-051: Parallel Computing
Practice Exam (October 26th, 2023)
Total: 100 points

Important Notes- READ BEFORE SOLVING THE EXAM

- If you perceive any ambiguity in any of the questions, state your assumptions clearly and solve the problem based on your assumptions. We will grade both your solutions and your assumptions.
- This exam is take-home.
- You have up to 24 hours to complete this exam.
- Your answers must be very focused. You may be penalized for giving wrong answers and for putting irrelevant information in your answers.
- Your answer sheet must be organized neatly.

Honor code (copy and paste to the first page of your exam)

"I understand the ground rules and agree to abide by them. I will not share answers or assist another student during this exam, nor will I seek assistance from another student or attempt to view their answers."

Problem 1

a. [10] Define Amdahl's Law and explain its significance in parallel computing.

b. [10] What is the difference between shared memory and distributed memory parallel systems? Give examples of each.

Problem 2

a. [10] Explain the concept of race conditions in parallel programming and provide a simple code example illustrating the problem.

b. [10] Describe two common techniques for handling race conditions.

Problem 3

a. [10] What are the advantages and disadvantages of using threads versus processes in parallel programming?

b. [10] Explain the producer-consumer problem and discuss how to solve it using semaphores.

Problem 4

a. [10] Briefly describe the concept of a deadlock in a parallel system. Provide a simple scenario illustrating a deadlock.

b. [10] Explain how to avoid deadlocks using appropriate strategies.

Problem 5

a. [10] What is a critical section in parallel programming? Why is it important to protect critical sections?

b. [10] Explain how mutexes can be used to protect critical sections.
