CSCI-UA.0480-051: Parallel Computing

Midterm Exam (Practice)

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 23 hours and 59 minutes to complete this exam.

• Your answers must be very focused. You may be penalized for wrong answers and for putting irrelevant information in your answers.

• You must upload a pdf file.

• Your answer sheet must have a cover page (as indicated below) and one problem answer per page (e.g., problem 1 in separate page, problem 2 in another separate page, etc.).

• This exam has 3 problems totaling 100 points.

• The very first page of your answer is the cover page and must ONLY contain:

- Your Last Name

- Your First Name

- Your NetID

- Copy and paste the honor code showed in the rectangle at the bottom of this page.

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

• You may use the textbook, slides, and any notes you have. But you may not use the internet.

• You may NOT use communication tools to collaborate with other humans. This includes but is not limited to G-Chat, Messenger, E-mail, etc.

• Do not try to search for answers on the internet; it will show in your answer and you will earn an immediate grade of 0.

• Anyone found sharing answers or communicating with another student during the exam period will earn an immediate grade of 0.

• "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."

1. Describe the trade-offs involved in choosing between different parallel programming models (e.g., shared memory, message passing) for a specific application. Consider factors such as programming complexity, scalability, and communication overhead in your response. (25 points)

\vspace{1cm} % Add space for the answer.

2. Explain how Amdahl's Law limits the potential speedup achievable through parallelization, and discuss strategies for mitigating its impact, such as algorithmic redesign or task decomposition techniques. Provide a concrete example. (35 points)

\vspace{2cm} % Add space for the answer.

3. Compare and contrast the concepts of load balancing and data locality in parallel computing. How do these factors influence the overall performance of a parallel program, and what techniques can be employed to improve both? (40 points)

\vspace{2.5cm} % Add space for the answer.