CSCI-UA.0480-051: Parallel Computing

Midterm Exam (Practice Exam)

Total: 100 points

Important Notes- READ BEFORE SOLVING THE EXAM

•”–b •ou 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.

••F†—2 Pxam is take-home.

•••ou have up to 23 hours and 59 minutes to complete this exam.

•••ou are allowed only one submission.

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

•••ou must upload a pdf file.

•••our 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.).

••F†—2 Pxam has 3 problems totaling 100 points.

••F†R `ery 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)

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

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

•”Fò æ÷B G y to search for answers on the internet; it will show in your answer and you will earn an immediate grade of 0.

•” àyone 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 challenges involved in debugging a parallel program, contrasting them with debugging a sequential program. Consider issues such as race conditions, deadlocks, and non-deterministic behavior in your explanation. How do debugging tools and techniques need to adapt to address these complexities? (30 points)

2. Explain the difference between data parallelism and task parallelism, providing concrete examples of algorithms or applications best suited to each paradigm. Discuss the trade-offs involved in choosing between these approaches for a given problem. (30 points)

3. Analyze the impact of Amdahl's Law on the potential speedup achievable through parallel computing. Provide a scenario where Amdahl's Law limits the effectiveness of parallelization, and suggest strategies for mitigating this limitation, such as algorithmic redesign or hardware improvements. (40 points)