CSCI-UA.0480-051: Parallel Computing

Midterm Exam (Mar 9th, 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.

• The exam is posted on Brightspace, assignments section, at the beginning of the Mar 9th lecture.

• You have up to 23 hours and 59 minutes from the beginning of the Mar 9th lecture to submit on Brightspace (in the assignments section). That is, you must submit before 2pm Friday March 10th.

• You are allowed only one submission, unlike assignments and labs.

• 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:

- You 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. Explain the concept of load balancing in parallel computing and describe two common strategies used to achieve it. Discuss the challenges involved in effectively balancing the workload across multiple processors, particularly in the context of dynamic task arrival. (25 points)

2. Compare and contrast Amdahl's Law and Gustafson's Law in the context of parallel computing performance. Provide an example scenario where one law might be more applicable than the other, and explain why. (35 points)

3. Describe the challenges associated with debugging and performance tuning parallel programs. Specifically, address the difficulties in identifying and resolving race conditions and deadlocks, and propose at least two debugging techniques or tools that can be used to alleviate these issues. (40 points)