Spring 2024
Exam II Day
Thursday, April 18

DO NOT OPEN THIS EXAM UNTIL YOU ARE INSTRUCTED TO DO SO

Name:_____. Student ID No._____

1. **NO TALKING UNTIL YOU LEAVE THE EXAM ROOM, PERIOD. Not now. Not when you are done. Not when you are collecting your things. Not when you are getting ready for the exam. NO TALKING!** Doing so will earn you an F on the exam, at a minimum.
2. You May **NOT ASK ANY QUESTIONS DURING THE EXAM** due to Requirements of Social Distancing. Do your best and note any concerns on your page.
3. **Write the exam with a dark colored pen or pencil.** Light colored pens or pencils do not scan well.

- **Plagiarism** will earn you an F in the course and a recommendation of expulsion from the university.
  - **a.** You may not refer to any material outside of this exam.
  - **b.** That is, you may **not** refer to notes, books, papers, calculators, phones, classmates, classmates' exams, and so forth.
  - **c.** **Do not talk to fellow students at any time while in the exam room.**
- Answer all questions on these pages. No code or pseudo-code is necessary – just a precise and concise explanation and justification.
- *Unsupported work will receive no credit.*

Q1 (5 pts) Given a mesh of size n with one piece of data stored per processor, give an asymptotically optimal algorithm to compute the parallel prefix of the n values. Efficiency counts! Justify your answer.

Q2 (6 pts) Given a tree with n pieces of data stored evenly per base processor, give a cost-optimal algorithm to determine the parallel prefix of the n values. Your algorithm should run in asymptotically optimal time. Efficiency counts! Justify your answer.

Q3 (5 pts) Suppose that you are given a hypercube of size n with one piece of marked/starred data per processor. For every piece of data, determine the ID of the processor that the piece of data should be sent to in order to solve the array packing problem. Efficiency counts! Justify your answer.

Q4 (4 pts) How many comparison-interchange units are there in an 8-element bitonic sort unit? Justify your answer.