Distributed Computing

Homework 1

Out: Thursday, 18/3/04
Due: Monday, 29/3/04

Problem 1

a. Analyze the communication complexity and the time complexity of Convergecast (a) when communication is synchronous and (b) when communication is asynchronous.

b. Generalize the Convergecast algorithm to collect all the information. That is, when the algorithm terminates, the root should have the input values of all processors.

Problem 2

Is leader election possible in a synchronous ring in which all but one processor have the same identifier? Either give an algorithm (and analyze it) or prove an impossibility result.

Problem 3

Design an algorithm to solve the leader election problem in a general synchronous network. Give a formal proof of the correctness of your algorithm and analyze its performance.
Hint: Use ideas from the flooding algorithm.

Problem 4

Solve exercise 2.8 of Attiya & Welch.

Problem 5

Solve exercise 3.10.2 of Attiya & Welch.