A. V. Gerbessiotis
CIS 485/Spring 1999
Quiz 1

Problem Set 1 (Due : Feb 17, 1999)

Problem 1.

Under which circumstances is speed more important than efficiency when designing a parallel algorithm? (Give an example to highlight your answer).

Problem 2.

Consider two algorithms for solving a problem of size N, one that runs in N steps on an N-processor machine and one that runs in $\sqrt{N}$ steps on an N^2 processor machine. Which algorithm is more efficient?

Problem 3.

Give an CREW algorithm for solving the problem of multiplying an $n \times n$ matrix A and vector x in $O(\lg n)$ time. How many processors does your algorithm require? How much work does it require? Comparing your algorithm to its sequential counterpart, what is its efficiency and speedup? (Use $O(.)$ notation to describe various results).

Problem 4.

Make the algorithm in Problem 3 to work on an EREW PRAM. What is its running time?

Problem 5.

You are given n binary values $X_1, \ldots, X_n$. Find the logical OR of these n values in constant time on a CRCW PRAM with n processors.

Problem 6 (extra credit).

For the algorithm in Problem 3, let us assume that we have only p processors available where $p < n$ and n is a multiple of p. How fast can we solve the matrix-vector multiplication problem on an EREW PRAM? Explain. Express parallel time, speedup and efficiency in terms of n and p.