11.1. Problem (4)  

The complexity class $NC$ consists of all languages $L \subseteq \{0, 1\}^*$ such that $L$ can be recognized by a CRCW-PRAM algorithm in poly-logarithmic time with a polynomial number of processors.

$P$ is the class of all languages which are recognizable by Turing machines within polynomial time.

Show that $NC \subseteq P$.

11.2. Problem (12)  

We would like to solve the one-to-all broadcasting problem, assuming that one processor sends a message to $n$ other processors.

(a) Show how to solve the one-to-all broadcasting problem in time $O(1)$ on a CREW PRAM with $n$ processors.

(b) Show that time $\Theta(\log_2 n)$ is sufficient and necessary, if we work with an EREW PRAM with $n$ processors.

11.3. Problem (8)  

A tree $T$ is given by parent pointers. Moreover we assign a real number $x_v$ to each node $v$. Show how to determine, in parallel for all nodes $v$, the sum of all values which are assigned to nodes on the path from $v$ to the root. You may work with CREW-PRAM in time $O(\log_2 n)$ with $n$ processors, provided $T$ has $n$ nodes.