42. (2 points) The input to this problem is a character string C of n letters. The problem is to find the largest k, such that $k < n$, and such that

$$C[1]C[2]\ldots C[k] = C[n-k+1]\ldots C[n-1]C[n]$$

That is, k is the length of the longest prefix that is also a suffix.

(a) Give a EREW parallel algorithm that runs in poly-logarithmic time with a polynomial number of processors.

(b) Give a CRCW Common parallel algorithm that runs in constant time with a polynomial number of processors.

43. (4 points) Consider the problem of merging two sorted arrays of size n into one sorted array.

(a) Give an $O(\log n)$ time algorithm using $O(n)$ processors on a CREW PRAM.

(b) Give an $O(1)$ time algorithm using a polynomial number of processors on a CRCW common PRAM.

44. (6 points) Design a parallel algorithm that takes as input a binary expression tree, where the leaves are Boolean values 0 or 1, and the internal nodes are the three standard logical operations: NOT, OR, and AND. The output should be the value of the expression represented by the tree. Your algorithm should run in $O(\log^2 n)$ time on a CREW PRAM with n processors, where n is the number of nodes in the tree. You may assume that each processor initially has a pointer to a unique, but arbitrary, node in the the tree.

45. (8 points)

(a) Design a parallel algorithm that finds the maximum number in a sequence $x_1, \ldots, x_n$ of (not necessarily distinct) integers. Your algorithm should run in time $O(\log \log n)$ on a CRCW Common PRAM with n processors.

(b) Design a parallel algorithm that finds the maximum number in a sequence $x_1, \ldots, x_n$ of (not necessarily distinct) integers in the range 1 to n. Your algorithm should run in constant time on a CRCW Priority PRAM with n processors. Note that it is important here that the x_i's have restricted range. In a CRCW priority PRAM, each processor has a unique positive integer identifier, and in the case of write conflicts, the value written is the value that the processor with the lowest identifier is trying to write.

(c)) Design a parallel algorithm that finds the maximum number in a sequence $x_1, \ldots, x_n$ of (not necessarily distinct) integers in the range 1 to n. Your algorithm should run in constant time on a CRCW Commmon PRAM with n processors. Note that it is important here that the x_i's have restricted range.