Advanced Algorithms
Spring 2021
IIIT Hyderabad

Homework 4, Due: Friday March 19, 2021

Problem 1. Consider the balanced binary tree approach for finding the prefix sum of an array of n elements. Does this approach run in the EREW PRAM model? What would be the asymptotic time and work complexity of the algorithm in the EREW model? Justify your answer.
(3 Points)

Problem 2. Recall the merging algorithm discussed in class that has a time of $O(\log \log n)$ and a work fo $O(n \log \log n)$. Complete the steps of arriving at an optimal $O(\log \log n)$ time merging algorithm in the CREW PRAM model. **(5 Points)**

Problem 3. What would be number of processors and work complexity of the parallel search algorithm when we require that the run time is in $O(\log \log n)$. **(2 Points)**

Problem 4. Design a parallel algorithm to find the bit-wise OR of n inputs in the CRCW model. What is the run time and the work complexity of your algorithm. Justfiy your answers. **(2 Points)**

Problem 5. Suppose we are given some p processors. Redo the analysis of the prefix sum algorithm to see how these p processors can simulate the n processors used in that algorithm. Obtain aysmptotic estimates on the time and the work complexity as a function of p and n. **(6 Points)**