Tecnológico de Monterrey

Fundamentos de computación

Homework 11

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1 Problems

Solve the following problems:

1. Provide a parallel algorithm for merging two lists of $n/2$ keys each. State the number of processors used and compute the metrics S_p, E_p and R_p.
2. Given the binary fan-in technique described in class to calculate the maximum of n numbers, calculate its speed-up ratio and its efficiency with respect to the sequential tournament version of the algorithm.
3. Prove (and provide an example) that the multiplication of two $n \times n$ matrices can be conducted by a PRAM program in $O(\log_2 n)$ steps if n^3 processors are available.
4. Let a binary operation take k cycles to complete when done serially. If this operation is pipelined using a k-segment pipe, show that the resulting speed-up in computing n operations is

$$S_k = \frac{nk}{n + k - 1}$$