Tecnológico de Monterrey

Fundamentos de computación

Homework 4

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1   Problems

Solve the following problems:

1. Solve problems 4.58 and 4.59 (Sara Baase)

2. Assume that the subroutine PARTITION within the quicksort algorithm produces a 9-to-1 split. First, generate the recurrence to compute the complexity of the algorithm under these conditions. Second, estimate the complexity of the recurrence and discuss if the unbalance in the partition makes the algorithm to loose the optimality.

3. Show that there is no comparison sorting algorithm whose complexity is linear for at least $n!/2$ inputs of length n, What about a fraction $1/n^3$ of inputs of length n? What about a fraction $1/2^n$?

4. Consider an array of characters R, W, y B, and you want to arrange the array in such a way that the Rs are first, then the Ws, and at the end the Bs. Describe a linear algorithm to accomplish this task.

5. Take a sequence of $2n$ numbers as input. Design an algorithm that partitions the numbers into n pairs, with the property that the partition minimizes the maximum sum of the pair. For example, say we are given the numbers (1,3,5,9). The possible partitions are ((1,3),(5,9)), ((1,5), (3,9)) and((1,9),(3,5)). The pair sums of these partitions are (4,14), (6,12) y (10,8). Thus the third partition has 10 as its maximum sum, which is the minimum over the three partitions. Establish the complexity of your algorithm.