

CS204: Algorithms
Mid Sem, Spring 2014

Attempt all questions

Time: 2 Hrs

Full marks: 30

1. Explain quick sort algorithm. Prove that the average case complexity for quick sort is $O(n \lg n)$. (5+5)
2. Solve it: $T(n) = 2T(n/2) + \frac{n}{\lg n}$ (5)
3. You are given two strings, A and B. You need to find out the minimum cost of operations to transform A to B. Operations allowed are (a) delete one character from A (b) insert one character in A (c) replace a character of A by another character c. Each operation has a cost associated with it. For example: Let A be FOOD and B be MONEY. Let all operations cost 1. The minimum cost for transforming A to B is 4. The operations are Replace F by M, Replace O by N, Replace D by E, Insert Y.
 - (a) Present an algorithm to find out the *minimum cost* to transform A to B and the *sequence of operations*.
 - (b) Present a working example to demonstrate your algorithm.
 - (c) Find complexity of your algorithm. (4+3+3)
4. Let $A[1...n]$ be an array of n distinct positive integers. If $i < j$ and $A[i] > A[j]$ then the pair (i, j) is called an inversion of A. Given n and an array A your task is to find the number of inversions of A. For example, the sequence 2, 4, 1, 3, 5 has *three* inversions (2, 1), (4, 1), (4, 3). (Hints: Mergesort) (5)