

Problem Set 6

Randomized Algorithms

Due Friday, October 11

1. [MR 4.9]. Consider the following randomized variant of the bit fixing algorithm. Each packet randomly orders the bit positions in the label of its source and then corrects the mismatched bits in that order. Show that there is a permutation for which, with high probability, this algorithm uses $2^{\Omega(n)}$ steps to route. **Hint (rot13):** Qb fbzrguvat fvzvyne gb gur ybjre obhaq sbe gur aba-enaqbzvmrq irefvba, ohg jvgu n ahzore bs ovgf gb svk qvssrerag sebz a/2.
2. [MR 7.2]. Two rooted trees T_1 and T_2 are said to be isomorphic if there exists a one to one mapping f from the nodes of T_1 to those of T_2 satisfying the following condition: v is a child of w in T_1 if and only if $f(v)$ is a child of $f(w)$ in T_2 . Observe that no ordering is assumed on the children of any vertex. Devise an efficient randomized algorithm for testing the isomorphism of rooted trees and analyze its performance. **Hint:** Recursively associate a polynomial P_v with each vertex v in a tree T .