Homework 5

Randomized Algorithms

Due Monday, October 9

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**: Do something similar to the permutation given in class as a lower bound for non-randomized bit fixing, but with a different number $k \neq n/4$ bits set to one on each half.

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. The book has a more detailed hint.