

## Theory of Network Communication

Fall 2002

### Assignment 8

**Problem 19** (4 points):

Show that there is a caching strategy for the hypercube that is  $O(\log n)$  competitive. (Hints: Use a proof similar to the one for the mesh. Recall the oblivious routing strategy we used for the hypercube and the fact that a  $d$ -dimensional hypercube contains two  $d - 1$ -dimensional hypercubes.)

**Problem 20** (4 points):

Consider the following strategy: Given a constant-degree network  $G = (V, E)$  with  $n$  nodes and flow number  $F$ , simply take a complete binary tree  $T(G)$  with the nodes of  $G$  as leaves for each object and map each node of  $T(G)$  randomly to a node in  $G$ . Show that in this case the competitive ratio of the caching strategy is  $O(F \log n)$ .