# Graph Theory

Assignment 7
Kishore Kothapalli

Due: 27-APR-2009

**Problem 1.** Find the eigenvalues and eigenvectors of the adjacency matrix corresponding to $K_n$ for $n \geq 1$. **(3 Points)**

**Problem 2.** An $n \times n$ matrix $P$ is called stochastic if all its entries are non-negative and for each row $i$, $\sum_j P_{ij} = 1$. It is called ”doubly stochastic” if, in addition, $\sum_i P_{ij} = 1$.

Show that for any stochastic matrix $P$, there exists an $n$-dimensional vector $\pi$ with non-negative entries so that $\_sum_i \pi_i = 1$ and $\pi P = \pi$.

**(3 Points)**

**Problem 3.** Let $G$ be a connected graph and let $uv \in E(G)$. For any simple random walk on $G$, show that $h_{uv} + h_{vu} = 2m$ if and only if $uv$ is a bridge. **(3 Points)**

**Problem 4.** Show that the resistance of the complete graph $K_n$ is $\Theta(1/n)$ and hence conclude that $C(K_n) \in O(n \log n)$. **(3 Points)**