Homework 7

Student Number:
Name:

Problem 1. (25 points) Is it always possible to follow directed edges (hyperlinks) in the web graph from any node (web page) to any other? Why or why not?

Problem 2. (25 points) Write down the transition probability matrix for the example in following firgure. What is the steady-state visit rate for each of the states?
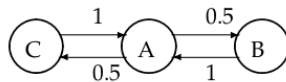

Figure 1: A simple Markov chain with three states; the numbers on the links indicate the transition probabilities.

Problem 3. (25 points) Consider a web graph with three nodes 1, 2 and 3. The links are as follows: $1 \to 2$, $3 \to 2$, $2 \to 1$, $2 \to 3$. Write down the transition probability matrices and solve for the long-term visit rate for the nodes assumming the following three values of the teleport probability: (a)$\alpha = 0$; (b) $\alpha = 0.5$ and (c) $\alpha = 1$.

Problem 4. (25 points) Consider a Markov chain with three states A, B and C, and transition probabilities as follows. From state A, the next state is B with probability 1. From B, the next state is either A with probability p_A, or state C with probability $1 - p_A$. From C the next state is A with probability 1. For what values of $p_A \in [0, 1]$ is this Markov chain ergodic?