

Due : Tuesday, October 28th 2003

1. Define the following terms: Aperiodic, Reccurent, Stationary distribution and Irreducible.

2. Define a simple symmetric random walk in 3 dimensions. Decide whether the random walk is transient or recurrent.

3. (**Nearest Neighbour Random Walk on a Circle**) Let S be $\{0, 1, 2, \dots, L\}$. At each step, the chain goes to the right with probability a and left with probability $1 - a$. If it tries go left from 0 it lands up at 0 and similarly if it tries to go right from L it lands up at 0.
 - (a) Write down the transition probability matrix, when $L = 4$.
 - (b) Calculate the stationary distribution for the chain, for general L .
 - (c) Show that the chain is irreducible and determine if it is aperiodic for general L .

4. Calculate the stationary distribution for the problems 2,3,5 of Hw8.

5. Do the following calculations for problems 3¹,4² of Hw7.
 - (a) Determine the closed³ communicating classes and their periodicity.
 - (b) Classify the states of the chain into transient and recurrent.
 - (c) Determine the stationary distribution.

Problems to be turned in are: 2,3,5

¹This model is usually referred to as the Erherenfest Diffusion model

²This model is usally referred to as the Gambler's ruin Chain

³A communicating class C is said to be closed if it is impossible to get out i.e. $P_{ij} = 0$ for $i \in C$ and $i \notin C$