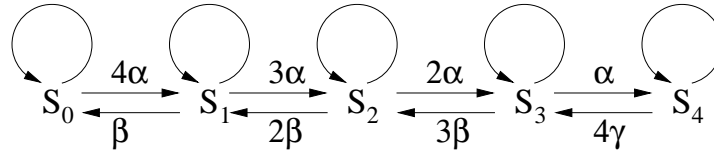**Math 5110 - Fall 2012**
**Homework Problem Set 3**
**Due Sept. 27, 2012**

Consider a discrete time Markov process with the following state diagram (This is actually a model of a potassium ion channel.)



1. Write the transition matrix for this problem.

2. Perform a stochastic simulation (100,000 steps) of this process in the case that $\alpha = 0.05$, $\gamma = \beta = 0.1$ and plot the normalized histogram of the distribution.

3. Compute the dominant eigenvalue and eigenvector for this transition matrix in the case that $\gamma = \beta$, and compare it to the estimate found using the simulation. Is 100,000 simulation steps enough to get good accuracy?

4. Perform a stochastic simulation of this process in the case $\gamma = 0$ and plot a histogram of the number of steps it takes to reach state 4 starting from state 0.

5. Determine the exact expected number of times to reach state 4 starting from state 0 in the case $\gamma = 0$, and compare this to the answer from your simulation. How many simulation trials are needed to get reasonable agreement between the exact answer and your simulation?