

Math 338, Problem for Week 14, Spring 2008

Consider a hidden Markov model whose hidden chain evolves in the state space  $S = \{0, 1, 2, 3\}$  with state transition matrix

$$A \triangleq \begin{bmatrix} 0 & .2 & .3 & .5 \\ 0 & .3 & .3 & .4 \\ 0 & .4 & .4 & .2 \\ 0 & .1 & .6 & .3 \end{bmatrix}$$

Assume that the states output one of three letters  $\{A, B, C\}$  with probabilities,

$$\begin{bmatrix} e_1(A) & e_1(B) & e_1(C) \\ e_2(A) & e_2(B) & e_2(C) \\ e_3(A) & e_3(B) & e_3(C) \end{bmatrix} = \begin{bmatrix} .25 & .35 & .4 \\ .1 & .25 & .65 \\ .5 & .45 & .05 \end{bmatrix}.$$

Find the probability that the first three letters produced by this model are  $ABC$ .