Universidade Federal de Minas Gerais - Programa de Pós-Graduação em Engenharia Elétrica

EEE945 - INTRODUÇÃO AOS PROCESSOS ESTOCÁSTICOS

HOMEWORK 1

Due April 29

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Problem 1. A family receives the newspaper every morning and, after being read, the newspaper is placed on a pile. Every afternoon, with probability 1/5, the pile is taken to the recycle bin. Moreover, the pile is always taken to the recycle bin whenever five papers are gathered. Is it possible to model the number of papers in the pile as a Markov chain? If yes, present the corresponding graph and the corresponding transition matrix.

Problem 2. Draw the graph for a Markov chain X_n with state space $\{1, 2, 3\}$ and transition matrix

$$P = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0.1 & 0.9 \\ 1 & 0 & 0 \end{bmatrix}$$

Problem 3. Find $\Pr\{X_3 = 2 \mid X_0 = 1\}$ e $\Pr\{X_9 = 1 \mid X_4 = 2\}$ for the chain in Problem 2 above.

Problem 4. Write a program to simulate the stochastic process of Problem 1 and present a plot of simulated trajectories.

Problem 5. Reconsider the scenario in Problem 1 and suppose in addition that the pile is emptied every Thursday. Is the new process a Markov chain? Why?