Rajarata University of Sri Lanka

Faculty of Applied Sciences

B.Sc.(Hons) in Industrial Mathematics

MAT 4305 – Stochastic Processes

Quiz 1

Answer all questions

1. In computer security applications, a honeypot is a trap set on a network to detect and counteract computer hackers. Honeypot data are studied in Kimou et al. (2010) using Markov chains. The authors obtain honeypot data from a central database and observe attacks against four computer ports—80, 135, 139, and 445—over 1 year. The ports are the states of a Markov chain along with a state corresponding to no port is attacked. Weekly data are monitored, and the port most often attacked during the week is recorded. The estimated Markov transition matrix for weekly attacks is

$$P = \begin{array}{c} \\ 80 \\ 135 \\ 139 \\ 445 \\ \text{No} \end{array} \begin{array}{c} \begin{array}{ccccc} 80 & 135 & 139 & 445 & \text{No attack} \end{array} \\ \begin{pmatrix} 0 & 0 & 0 & 0 & 1 \\ 0 & 8/13 & 3/13 & 1/13 & 1/13 \\ 1/16 & 3/16 & 3/8 & 1/4 & 1/8 \\ 0 & 1/11 & 4/11 & 5/11 & 1/11 \\ 0 & 1/8 & 1/2 & 1/8 & 1/4 \end{pmatrix} \end{array},$$

with initial distribution $\alpha = (0, 0, 0, 0, 1)$.

(a) Which are the least and most likely attacked ports after 2 weeks?

(b) Find the long-term distribution of attacked ports.

2. Give the transition matrix for the transition graph given below.