



SRM Institute of Science and Technology
Department of Mathematics
18MAB204T- Probability and Queueing Theory
Module – V
Tutorial Sheet – 15

Questions

1	Consider a Markov chain with the state space $\{0, 1\}$ and tpm $P = \begin{bmatrix} 1 & 0 \\ 1/2 & 1/2 \end{bmatrix}$. (i) Draw the state transition diagram. (ii) Is the state 0 recurrent? Explain (iii) Is the state 1 transient? Explain.
2	The transition probability matrix of a three state Markov chain $\{X_n\}, n = 1, 2, 3, \dots$ having three states 0, 1 and 2 is given by $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$. Draw the state transition diagram.
3	Find periodic and aperiodic states in each of the following transition probability matrices. (a) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1/4 & 3/4 \\ 1/2 & 1/2 \end{bmatrix}$
4	Does the transition matrix $\begin{bmatrix} 1 & 0 & 0 \\ 1/2 & 1/2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ correspond to an absorbing Markov chain? (Hint: If at least one of the states is absorbing)
5	Find the nature of the states of the Markov chain with the tpm $P = \begin{bmatrix} 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \\ 0 & 1 & 0 \end{bmatrix}$
6	Three boys A, B and C are throwing a ball to each other. A always throws the ball to B and B always throws the ball to C, but C is just as likely to throw the ball to B as to A. Show that the process is Markovian. Find the transition probability matrix and classify the states.