

## Assignment – Module 5

1. Daily weather at a place may be considered as a two state Markov Chain, with the transition probability matrix (TPM) given by

	W	D
W	0.7	0.3
D	0.4	0.6

where W indicates a rainy day and D a dry day. What is the probability that it will be a rainy day four days from today, given that today is a rainy day? Obtain the steady state probability of a rainy day.

2. Consider a 2-state, first order homogeneous Markov Chain for a sequence of wet and dry days. State 1 is dry and state 2 is wet. The transition probability matrix for the Markov Chain is given by

	dry	wet
dry	0.8	0.2
wet	0.4	0.6

What is the probability of the day 3 being in wet state, if day 0 is a dry day?

3. Consider a Markov chain model for daily rainfall in a subcatchment. Consider state-1 represents a dry condition, state-2 represents an intermediate rainfall condition and state-3 represents a completely saturated condition. Assume the transition probability matrix is

$$P = \begin{bmatrix} 0.1 & 0.4 & 0.5 \\ 0.1 & 0.7 & 0.2 \\ 0.1 & 0.6 & 0.3 \end{bmatrix}$$

Assuming that it is not possible to pass directly from state-1 to state-3 or from state-3 to state-1 without going to state-2, what fraction of time is the subcatchment in each of the states.

4. Consider the subcatchment in problem 3, generate a sequence of 50 possible states corresponding to  $t = 1, 2, \dots, 50$ .
5. Consider that today's weather condition depends on the previous two days weather condition (i.e., whether or not it rains today depends on previous weather conditions through the last two days). The transition probability matrix is given by

$$P = \begin{bmatrix} 0.6 & 0 & 0.4 & 0 \\ 0.5 & 0 & 0.5 & 0 \\ 0 & 0.3 & 0 & 0.7 \\ 0 & 0.4 & 0 & 0.6 \end{bmatrix}$$

State 0: if it rained today and yesterday;

State 1: if it rained today but not yesterday;

State 2: if it rained yesterday but not today;

State 3: if it did not rain yesterday or today.

Obtain the probability that it will rain on Friday, given that it rained on Tuesday and Wednesday.