WST312 Stochastic Processes 2018
Practical 2

Consider a time-homogeneous Markov chain $\{X_t : t = 0,1,2,3...\}$ with states $\{1,2,3\}$. The probability of moving from state i to state $i-1$ is 0.22 for $i = 1,2,3$ (if $i = 1$ the process goes to $i = 3$), the probability of staying in state 1 or 2 is 0.18 and the probability of staying in state 3 is 0.65. The process is initially in state 1 with probability 0.2 and state 2 with probability 0.26.

a)   What is the transition probability matrix for this process? (No computer work necessary.)

b)   Write a program in which you can specify the states a,b,c,d and i_0 before hand to calculate the probability

$$P[X_1 = a, X_2 = b, X_3 = c, X_4 = d \mid X_0 = i_0].$$

Output the result when choosing the values: $a = 1, b = 2, c = 1, d = 3$ and $i_0 = 2$.

Which theorem do you use to calculate this probability?

c)   Write a program in which you can specify the states a,b,c,d before hand to calculate the probability

$$P[X_1 = a, X_2 = b, X_3 = c, X_4 = d].$$

Output the result when choosing the values: $a = 1, b = 2, c = 1, d = 3$.

Which theorem do you use to calculate this probability?

d)   Write a program in which you can specify the states a,b and i_0 before hand to calculate the probability

$$P[X_1 = a, X_4 = d \mid X_0 = i_0].$$

Output the result when choosing the values: $a = 3, d = 1$ and $i_0 = 2$.

Which theorem do you use to calculate this probability?

For all code mentioned above the question should be done using SAS proc iml as well as in R.