EXERCISE 1:

>install.packages(“markovchain”)

> library(markovchain)

> states<-c("On",'Off',"Idle")

> transition\_matrix<-matrix(c(0.6,0.3,0.1,0.1,0.8,0.1,0.3,0.3,0.4),nrow=3,byrow=TRUE)

> mc<-new("markovchain",states=states,transitionMatrix=transition\_matrix)

> print(mc)

On Off Idle

On 0.6 0.3 0.1

Off 0.1 0.8 0.1

Idle 0.3 0.3 0.4

> steady\_state<-steadyStates(mc)

> print(steady\_state)

On Off Idle

[1,] 0.2571429 0.6 0.1428571

> set.seed(456)

> sim<-rmarkovchain(n=20,object=mc,t0="On")

> print(sim)

[1] "On" "On" "Off" "On" "Off" "Off" "Off" "Off" "Off" "Off" "Off"

[12] "Off" "Off" "On" "On" "Off" "On" "On" "Off" "Off"

> if(is.irreducible(mc)){

+ cat("The Markov chain is ergodic.\n")

+ }else{

+ cat("The Markov chain is not ergodic.\n")

+ }

The Markov chain is ergodic.

EXERCISE 2:

>install.packages(“markovchain”)

> library(markovchain)

> states<-c("sunny",'cloudy',"rainy")

> transition\_matrix<-matrix(c(0.7,0.2,0.1,0.3,0.5,0.2,0.2,0.3,0.5),nrow=3,byrow=TRUE)

> mc\_whether<-new("markovchain",states=states,transitionMatrix=transition\_matrix)

> print(mc\_whether)

sunny cloudy rainy

sunny 0.7 0.2 0.1

cloudy 0.3 0.5 0.2

rainy 0.2 0.3 0.5

> steady\_state\_whether<-steadyStates(mc\_whether)

> print(steady\_state\_whether)

sunny cloudy rainy

[1,] 0.4634146 0.3170732 0.2195122

> set.seed(789)

> sim\_whether<-rmarkovchain(n=30,object=mc\_whether,t0="sunny")

> print(sim\_whether)

[1] "sunny" "sunny" "sunny" "sunny" "sunny" "sunny" "sunny"

[8] "sunny" "sunny" "sunny" "sunny" "sunny" "sunny" "sunny"

[15] "sunny" "sunny" "sunny" "sunny" "cloudy" "cloudy" "cloudy"

[22] "cloudy" "cloudy" "cloudy" "cloudy" "sunny" "sunny" "sunny"

[29] "cloudy" "sunny"

> if(is.irreducible(mc\_whether)){

+ cat("The whether Markov chain is ergodic.\n")

+ }else{

+ cat("The whether Markov chain is not ergodic.\n")

+ }

The whether Markov chain is ergodic.