2.13a

By assuming non-informative prior, we get parameters alpha and beta for prior distribution for theta to be 0.

Therefore posterior distribution for theta given theta will be Gamma(sum(yi),n)

Simulation for computing 95% posterior interval for predictive distribution y, given theta > Poisson(theta), where theta can be drawn from posterior distribution of theta, given y > Gamma(238,10):

R code:

theta <- rgamma(n = 10000,shape = 238,scale = 1/10)

pred\_y <- rpois(n = 10000,lambda = theta)

sort\_pred\_y<- sort(pred\_y)

conf\_interval\_95 <- sort\_pred\_y[c(251,9750)]

print(conf\_interval\_95)

[1] 14 34

Posterior interval answer: [14, 34]

2.13b

Simulation for computing 95% posterior interval for predictive distribution y, given theta and x > Poisson(8\*1011\* theta), where theta can be drawn from posterior distribution of theta, given y and x > Gamma(238,5.715\*1012):

Rcode:

theta <- rgamma(n=10000,shape = 238,scale = 1/(5.715\*10^12))

y\_pred <- rpois(n=10000,lambda = 8\*10^11 \* theta)

sort\_pred\_y <- sort(y\_pred)

conf\_interval\_95 <- sort\_pred\_y[c(251,9750)]

print(conf\_interval\_95)

[1] 22 46

Posterior interval answer: [22, 46]

2.13c. Repeat (a), replacing ‘fatal accidents’ with ‘passenger deaths.’ Therefore, replace 238 with 6919 :

R code:

theta <- rgamma(n = 10000,shape = 6919,scale = 1/10)

pred\_y <- rpois(n = 10000,lambda = theta)

sort\_pred\_y<- sort(pred\_y)

conf\_interval\_95 <- sort\_pred\_y[c(251,9750)]

print(conf\_interval\_95)

[1] 638 745

Posterior interval answer: [638, 745]

2.13d. Repeat (b), replacing ‘fatal accidents’ with ‘passenger deaths.’ Therefore, replace 238 with 6919 :

R code:

theta <- rgamma(n=10000,shape = 6919,scale = 1/(5.715\*10^12))

y\_pred <- rpois(n=10000,lambda = 8\*10^11 \* theta)

sort\_pred\_y <- sort(y\_pred)

conf\_interval\_95 <- sort\_pred\_y[c(251,9750)]

print(conf\_interval\_95)

[1] 904 1035

Posterior interval answer: [904, 1035]