MA226 : Monte-Carlo Simulation
Generating Numbers from Discrete Distributions and Mixture Distributions

Assignment 7

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1 Problem 1

Here we have to generate numbers from Geometric Distribution.

1.1 Source code of the solution

```
n<-50
p<-0.5
q<-1-p

u<-runif(n)

sample<-as.integer((log(u)/log(q)))+1

cat("Mean: ",mean(sample),"\n")
cat("Variance: ",var(sample),"\n")

png("que1.png")
hist(sample,col="red",plot=TRUE)
```

1.2 Plot

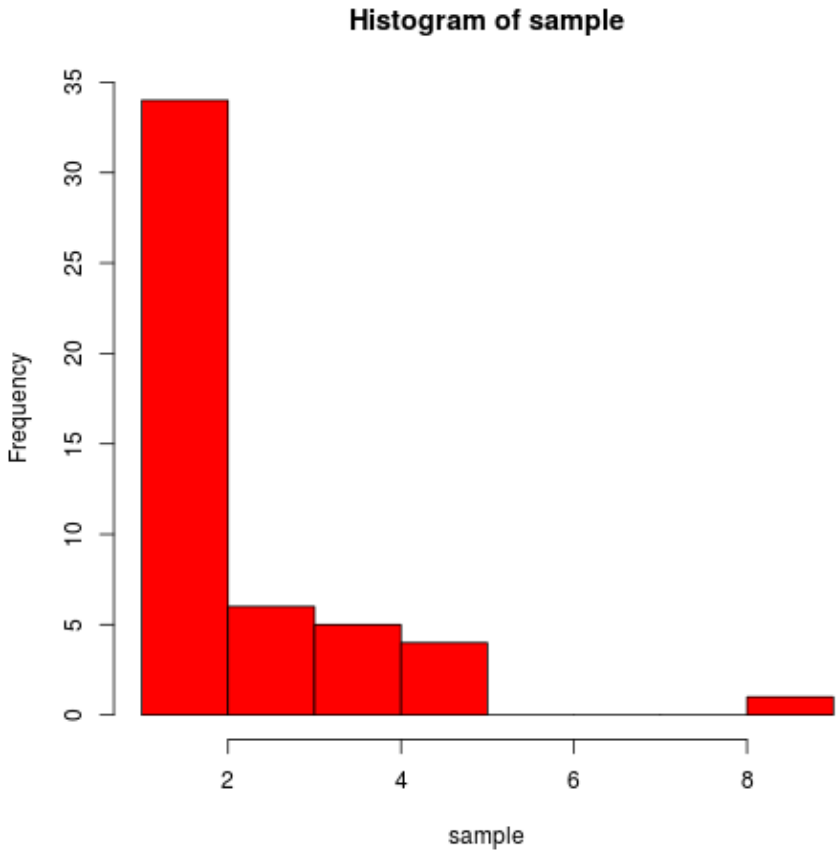

Abbildung 1: Histogram of Generated Geometric Distribution

2 Problem 2

In this problem, we have to generate numbers from Poisson Distribution.

2.1 Source code of the solution

```
n<-50
param<-2

sample<-vector(length=n)
i<-0


while(i<=n){
        i<-i+1
        u<-runif(1)

        p<-exp(-param)
        f<-p

        j<-0
        while(1){
                if(u<f){
                        sample[i]<-j
                        break
                }
                p<-p*param/(j+1)
                f<-f+p
                j<-j+1
        }
}

cat("Mean: ",mean(sample),"\n")
cat("Variance: ",var(sample),"\n")


png("que2.png")
hist(sample,col="cyan",plot=TRUE)

cdf<-ecdf(sample)
png("que2_cdf.png")
plot(cdf)
```

2.2 Plot

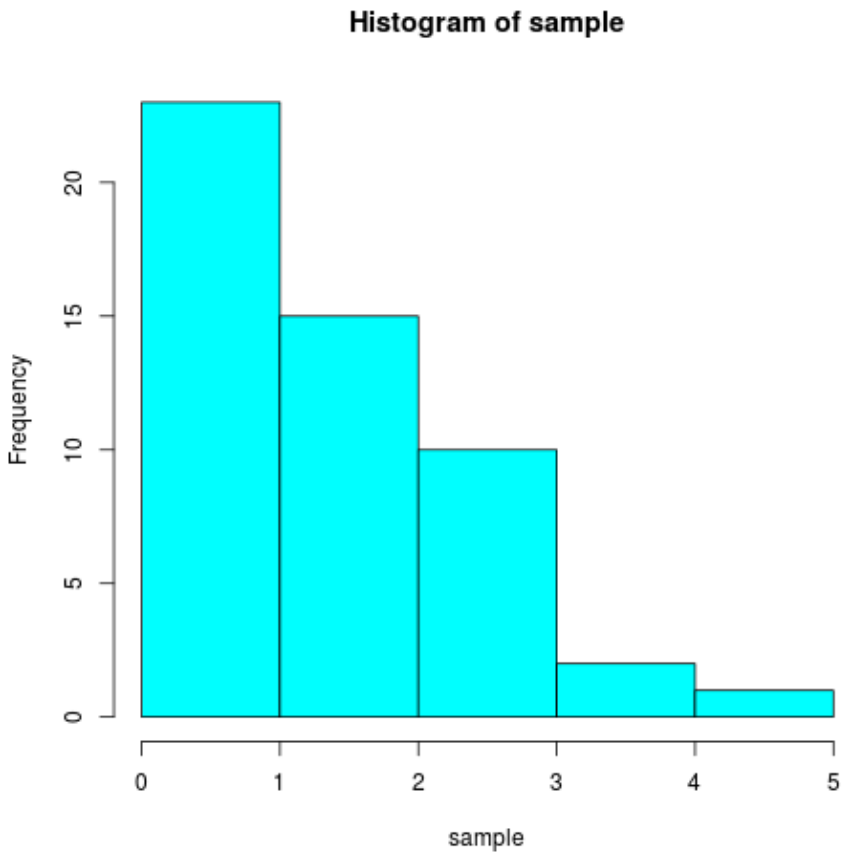

Abbildung 2: PDF of the Generated Poisson Distribution

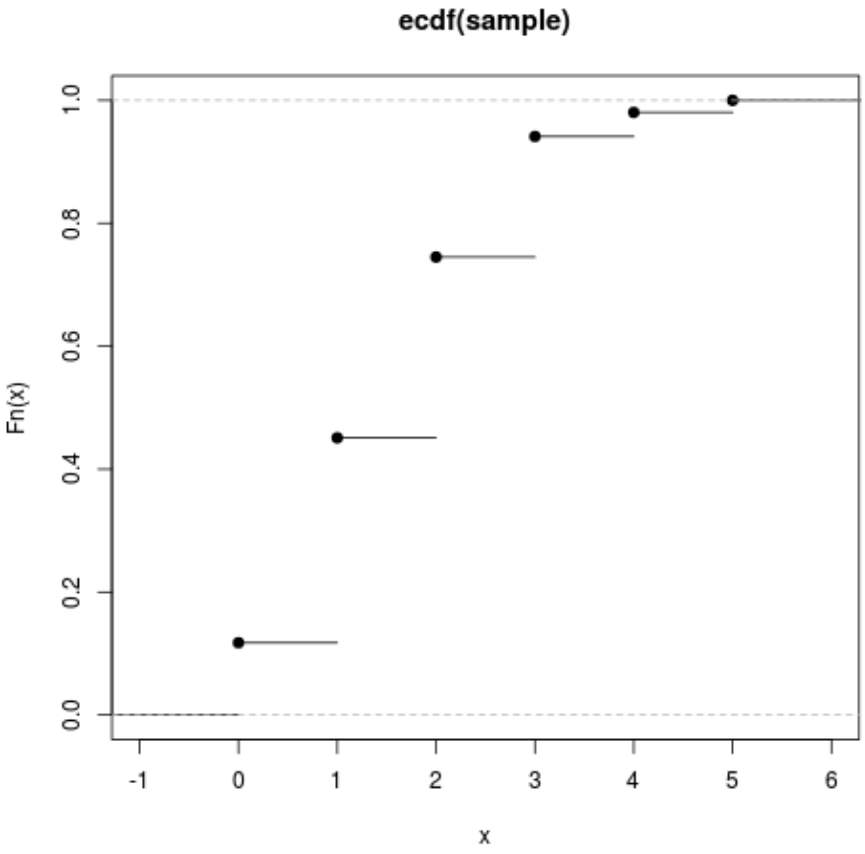

Abbildung 3: CDF of Generated Poisson Distribution

3 Problem 3

In this problem, we have to generate a distribution which is a mixture distribution. The mixture distribution consists of two weibull distritution.

3.1 Source code of the solution

```
n<-50
p<-0.4

invW<-function(u,theta,beta){
        x<--log(1-u)
        y<-x^(1/beta)
        return(y/theta)
}

sample<-vector(length=n)
i<-0
while(i<=n){
        i<-i+1

        u1<-runif(1)

        if(u1<=p){
                sample[i]<-invW(runif(1),1,2)
        }
        else{
                sample[i]<-invW(runif(1),1,1.5)
        }
}

cat("Mean: ",mean(sample),"\n")
cat("Variance: ",var(sample),"\n")

png("que3.png")
hist(sample,col='cyan',breaks=10)
```

3.2 Plot of the points

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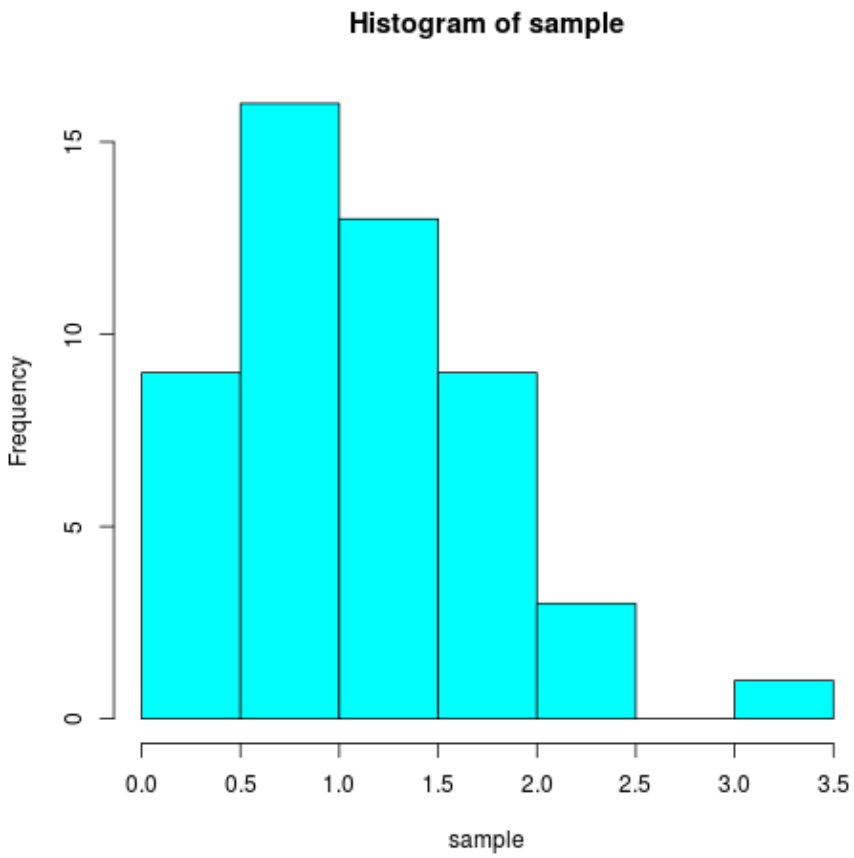

Abbildung 4: 2D plot for (u_{i-1}, u_i) , seed=7