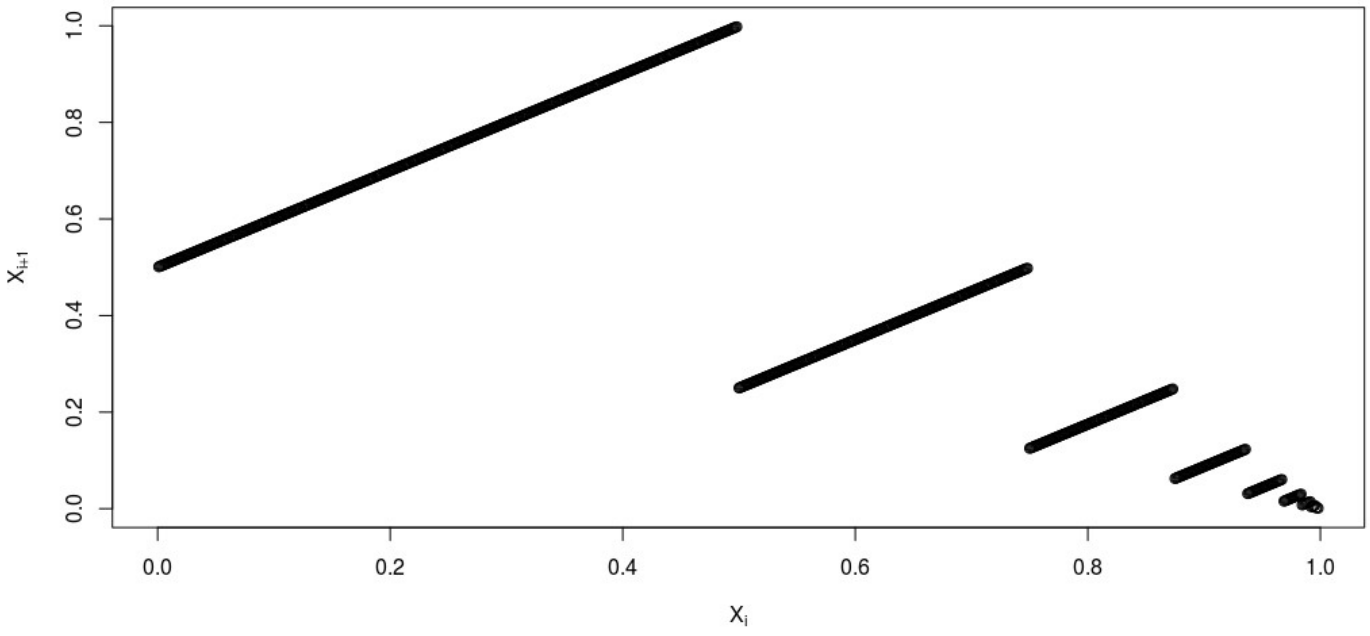
LAB 12

◆ Question 1

a) Following are the first 25 values of Van der Corput Sequence:

```
0.50000 0.25000 0.75000 0.12500 0.62500 0.37500 0.87500 0.06250
0.56250 0.31250 0.81250 0.18750 0.68750 0.43750 0.93750 0.03125
0.53125 0.28125 0.78125 0.15625 0.65625 0.40625 0.90625 0.09375
0.59375
```

b) The plot of overlapping pairs (X_i , X_{i+1}) for first 1000 values of Van der Corput Sequence are as following:

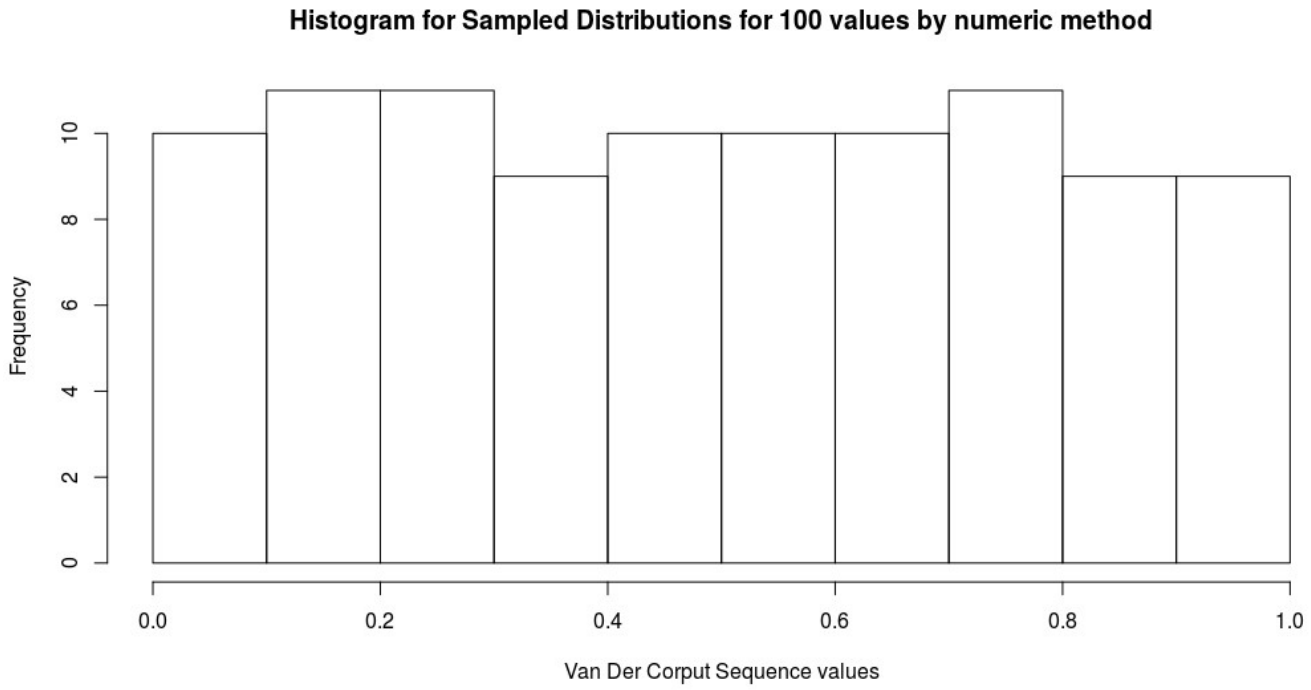


Observations :

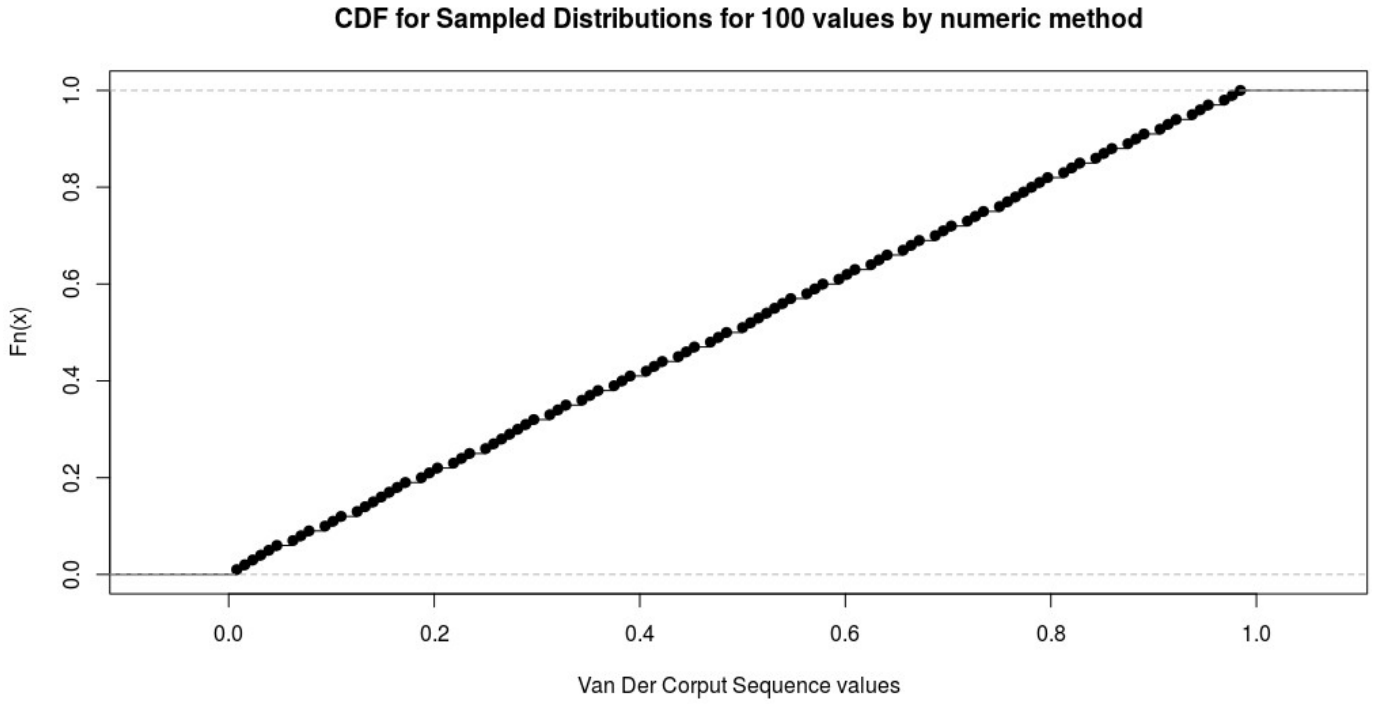
The generator is not very efficient as the values are predictable because (X_i,X_{i+1}) plot is not uniformly distributed in the 2-D plane.

c) Sampled Distribution for first 100 values of Van der Corput sequence is as following:

Histogram

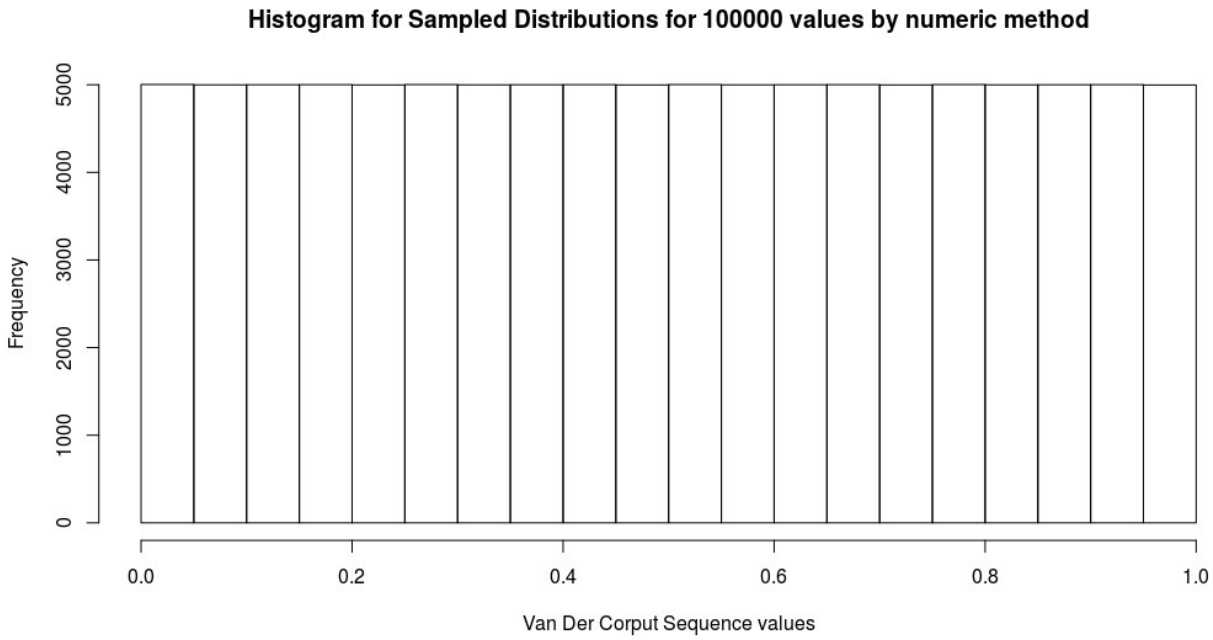


Cumulative Distribution

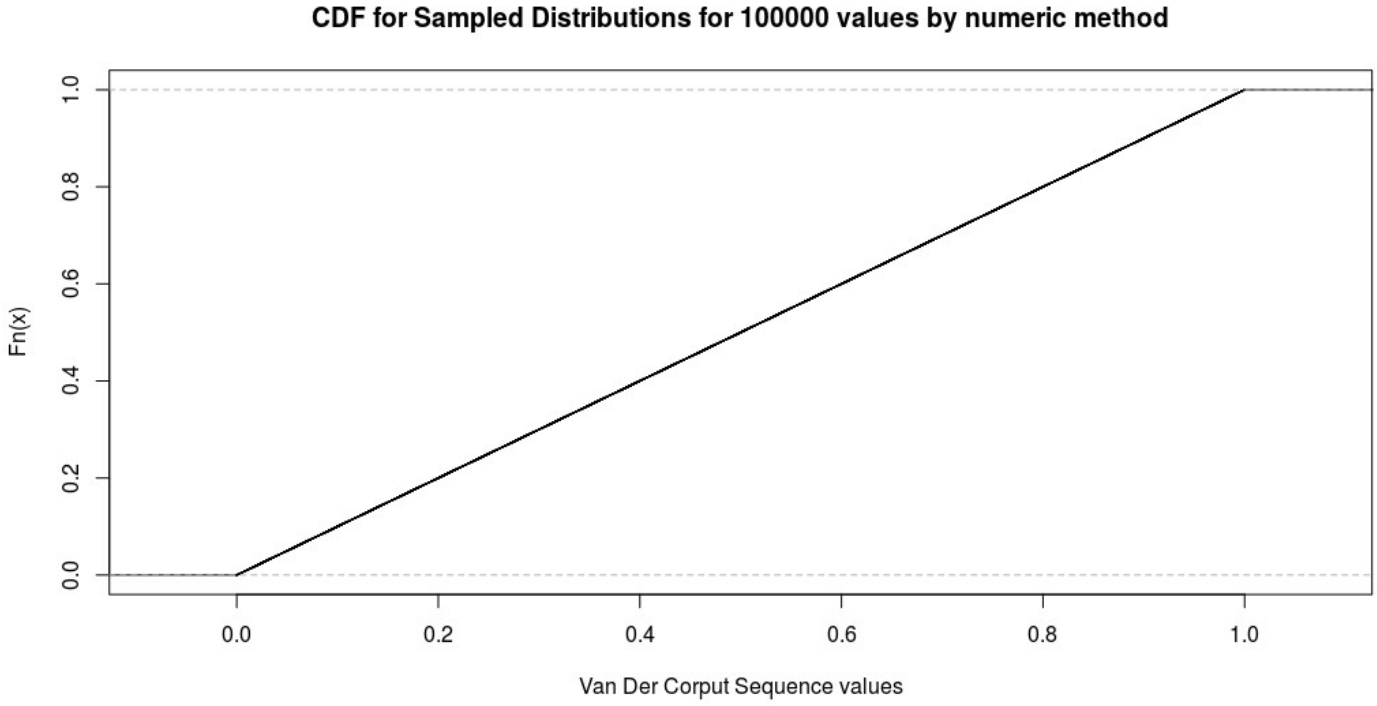


d) Sampled Distribution for first 100000 values of Van der Corput sequence is as following:

Histogram



Cumulative Distribution



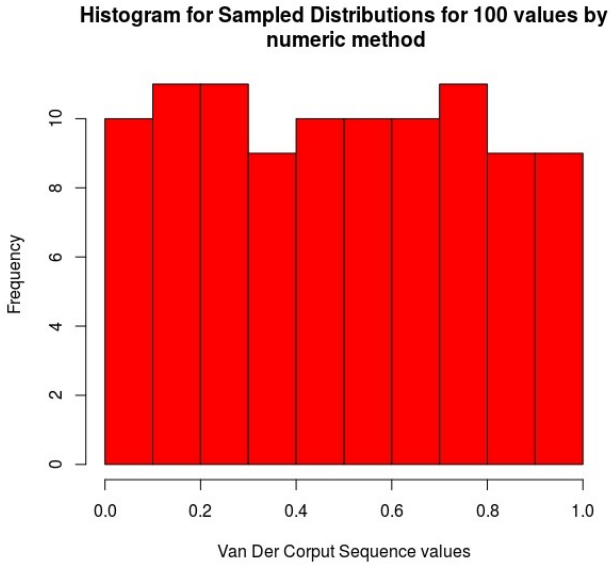
e) 100 and 100000 values were generated using the following LGC :

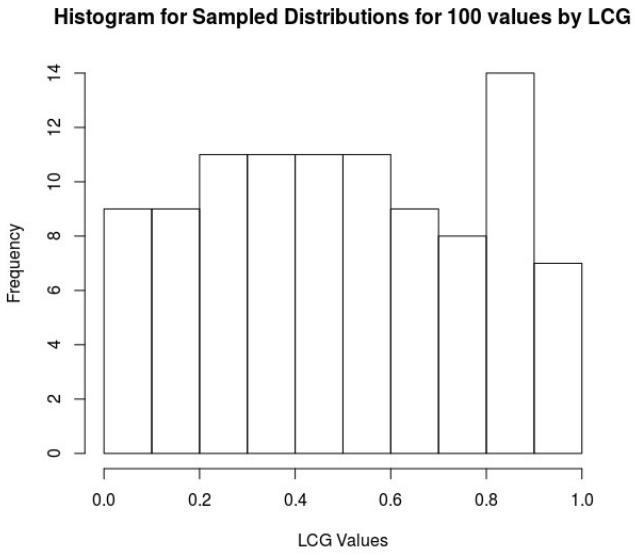
$$\mathbf{X_{i+1} = (a * X_i + b) \bmod m}$$

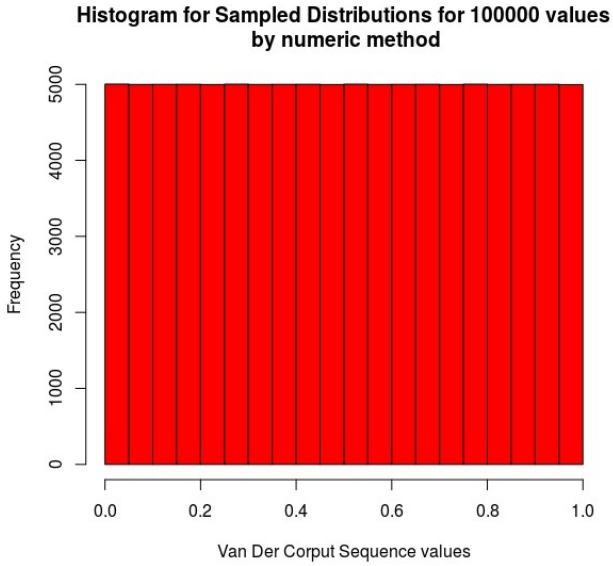
$$\mathbf{U_i = X_i/m}$$

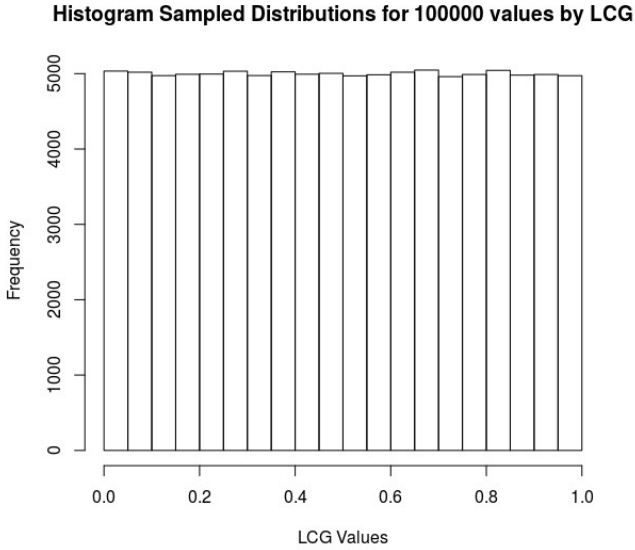
where X_0 (seed) = 1, a = 1597, b = 51749, m = 244944

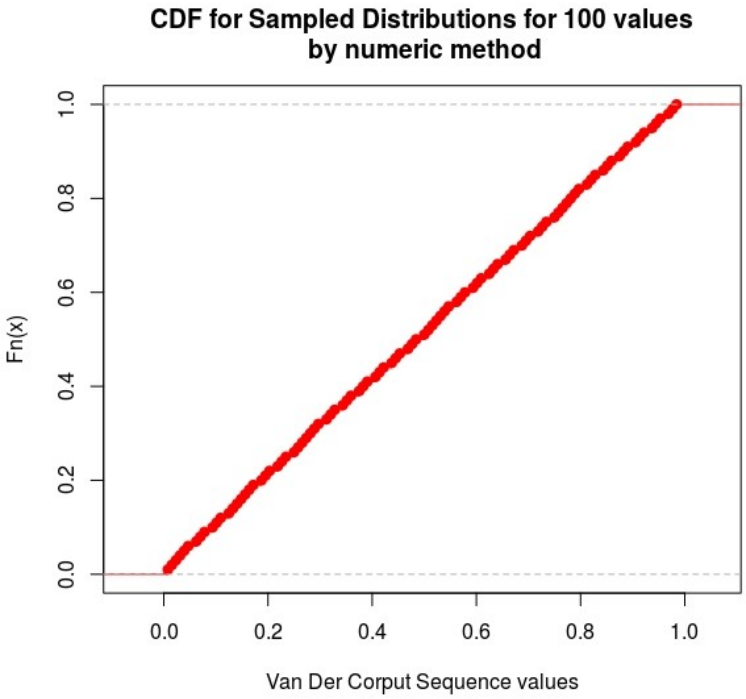
Comparison between numerical generation and Linear congruence generation:

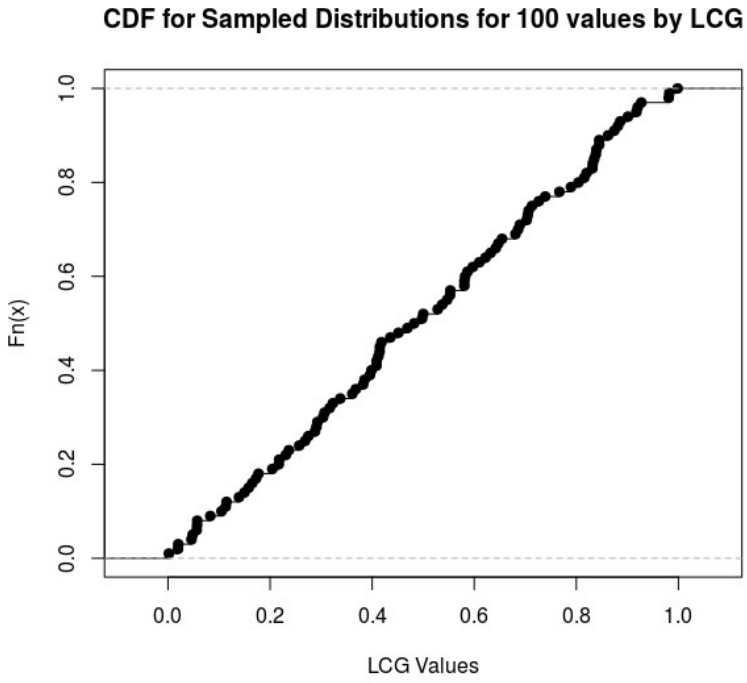


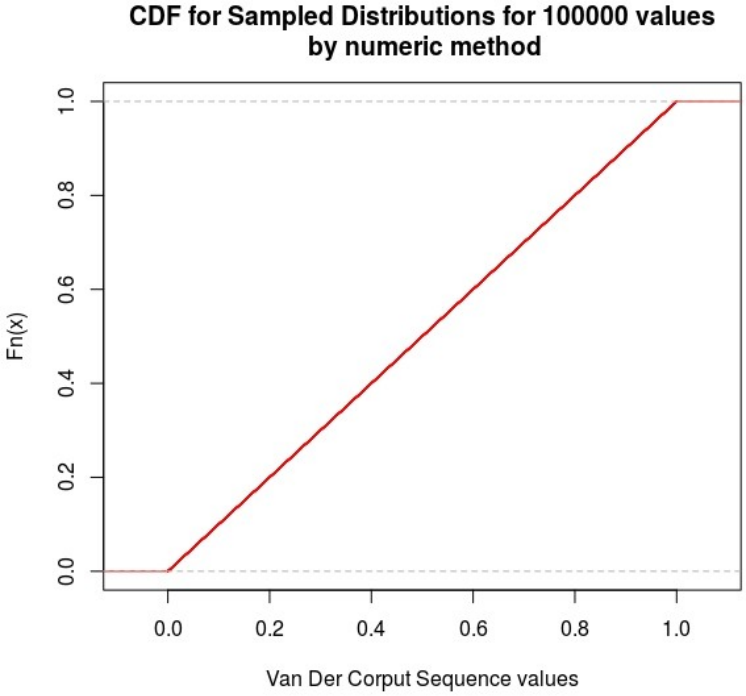


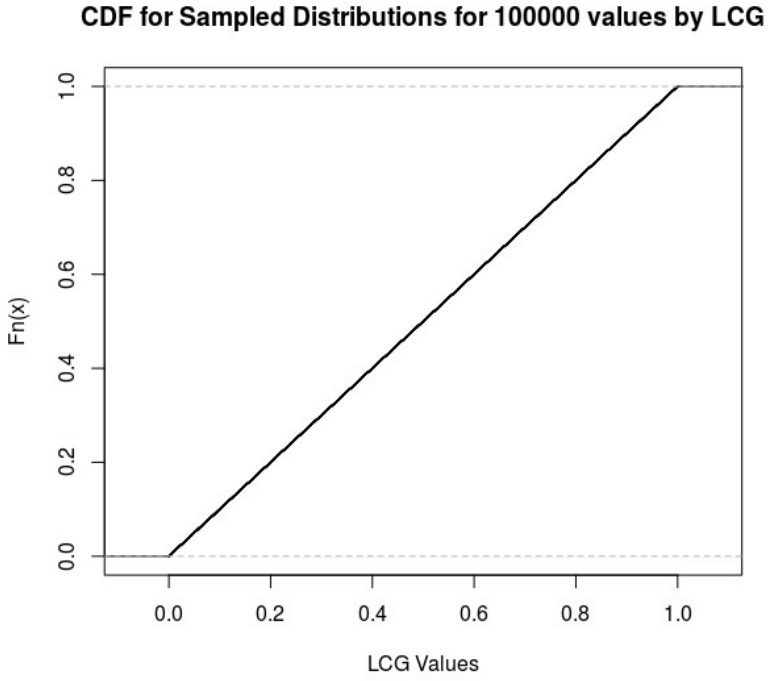












Observations :

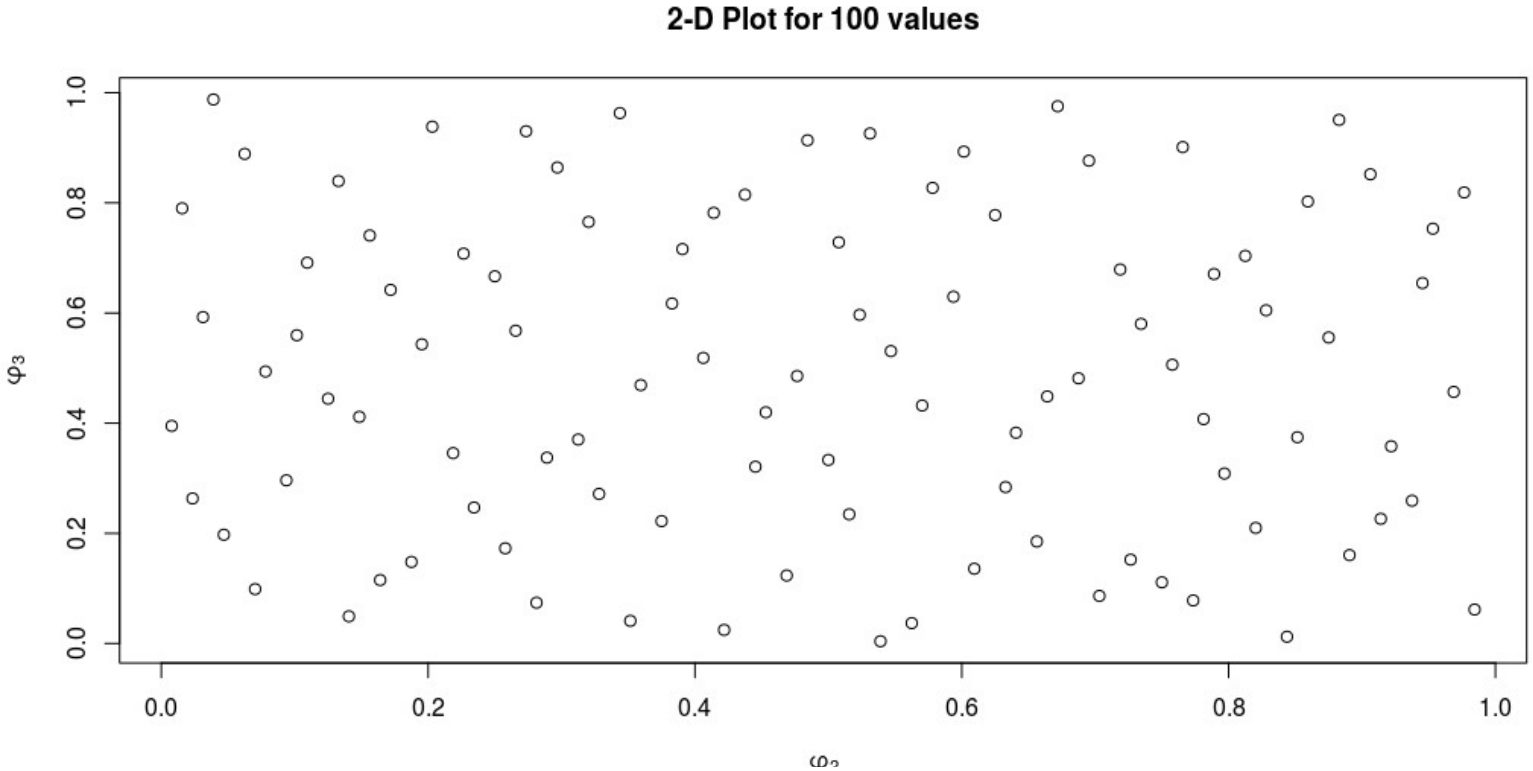
Values generated by numeric method are more uniform and the variance/error in numerically generated values are less than that of linear congruence generation.

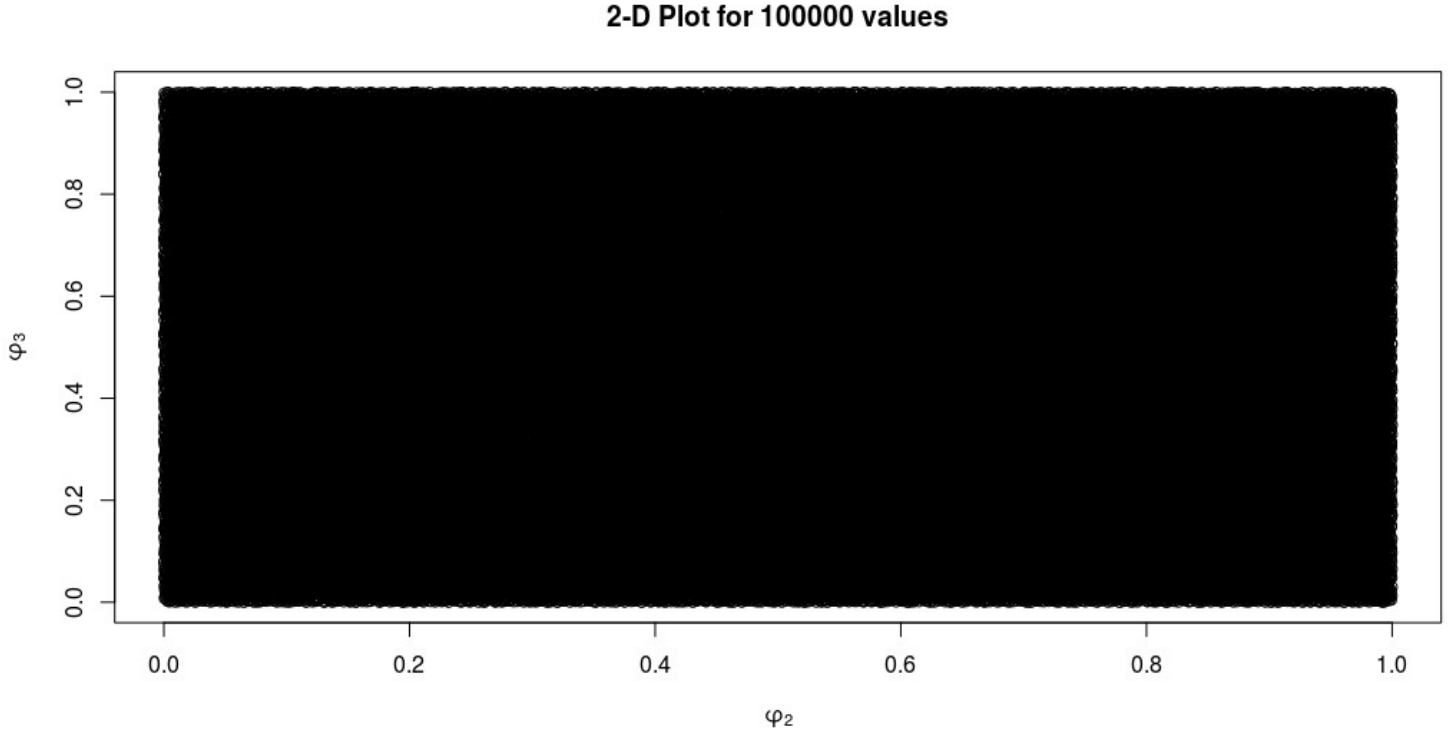
◆ Question 2

Following plots were obtained for Halton sequence

$X_i = (\varphi_2(i) , \varphi_3(i))$ (as points in R2)

for the 100 and 100000 values respectively:





Observations :

The generated points are in the range [0,1] and the distribution is closer to uniform. Since we are generating in 2 dimension, error/variance of generated values will be less that of numeric method.