Assignment 5

Question 1

Using the Lewis Goodman Miller pseudo-random number generator, perform the following tasks:

a) Generate 10,000 sequences of uniform distribution using the Lewis Goodman Miller pseudo-random algorithm and create a histogram graph.

b) Use the random function in Numpy to perform the same tasks as in (a).

Question 2

Using the ANSI C pseudo-random number generator, perform the following tasks:

a) Generate 10,000 sequences of uniform distribution using the pseudo-random algorithm.

b) Use the result from (a) to generate 10,000 samples for the following distribution.

Question 3

Using the Lewis Goodman Miller pseudo-random number generator, perform the following tasks:

a) Generate 1,000 samples from a binomial distribution with parameters $n = 44$ and $p = 0.64$.

b) Plot a histogram for the generated samples and calculate the probability of the binomial distribution being greater than or equal to 40 using the generated samples.

c) Calculate the probability of the binomial distribution being greater than or equal to 40 using the formula for the binomial distribution and compare it with the result from (b).

Question 4

Using the ANSI C pseudo-random number generator, perform the following tasks:

a) Generate 5,000 samples from a uniform distribution in the range [0, 1].

b) Generate 5,000 samples with a standard normal distribution (mean = 0, variance = 1) using the Box-Muller algorithm and plot a histogram.

c) Generate 5,000 samples with a standard normal distribution (mean = 0, variance = 1) using the Polar-Marsaglia algorithm and plot a histogram.

d) Compare the time taken to generate 5,000 samples for each method. Which methodology is more efficient? If the time difference is small, increase the sample size and check again.

Question 5

a) Plot the density graph using the probability density function of a standard normal distribution (mean = 0, variance = 1) from -4 to 4 with a step size of 0.0005.

b) Explain the differences between the graph generated in Question 4 and the density graph in (a).