Random Number Generation

1. Using the *Linear Congruent Generator* with the following parameters and initial seed, generates $N = 10000$ samples of a *Uniform* distribution in the range $[0,1)$.

m	2^{32}
a	1664525
c	1013904223
$seed$	521191478

2. With the numbers generated at the previous step, generate:
    a. $N_1 = 10000$ samples of an *Exponential distribution* of rate $\lambda = 0.1$
    b. $N_2 = 10000$ samples of a *Pareto distribution* with parameters $a = 1.5$, $m = 5$
    c. $N_3 = 2500$ samples of an Erlang distribution with $k = 4$, and $\lambda = 0.4$
    d. $N_4 = 5000$ samples of a Hypo-Exponential distribution with rates $\lambda_1 = 0.5$, $\lambda_2 = 0.125$
    e. $N_5 = 5000$ samples of a Hyper-Exponential distribution with rates $\lambda_1 = 0.5$, $\lambda_2 = 0.05$, $p_1 = 0.55$

    Please note that each of the previous cases should use exactly all the $N = 10000$ samples of the *Uniform* distribution in the range $[0,1)$ generated in the previous step.
3. For each distribution, compare on a plot the *Empirical distribution* obtained from the samples, with the corresponding real distribution (using its formula), in the range $x = [0,25]$.
4. The previous distributions correspond to the length of a file, expressed in GB. The charge for storing and making available each file by a provider is:
    a. 0.01 \$/GB if the file is less than 10 GB
    b. 0.02 \$/GB if the file is greater than 10 GB

    In other words, a file that is 2.5 GB costs 0.025 \$, while one that is 12 GB costs 0.24 \$. Compute the total cost for storing the N_i files in each of the previous five scenarios.