

Assignment 2

Q1

Let us define the following random number

0.2 0.4 0.9 0.4 0.21 0.5 0.31 0.71 0.41 0.6

Implement **Layer algorithm** to improve random variables (observations) under uniform distribution.

Remark: *if observations are not improved by layer algorithm, just show the reason why improving is not satisfied.*

Q2

The following table shows the distribution of the service time for number of processes arrived to computer system.

Service time X	No. of Clients
0 – 25	16
25 - 50	14
50 – 75	6
75 – 100	12
100 – 125	7
125 – 150	0
150 – 175	3

Determine the service times under continuous empirical distribution of two clients C1, C2 corresponding to the random numbers $r_1=0.53$ and $r_2 = 0.88$ respectively.

Q3

Let us define the following ten random numbers:

0.5	0.8	0.3	0.1	0.9	0.61	0.49	0.13	0.84	0.7
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Implement **Layer algorithm** to improve observations generated by using **positive exponential distribution** with experimental mean (μ) equal to 2 and then discuss which criteria is used to select the following:

1- Number of layers. 2- Size of Layer. 3- And the boundary of each Layer.

Q4

Answer the following:

- 1 Generate 7 random numbers according to Multiplicative Congruential algorithm.
- 2 Using Chi square to check the following frequency of 100 random numbers:

Class	1	2	3	4	5	6
frequency	25	10	10	20	25	10

Where

And χ^2 Table is define as the following:

v(DOF)	$\chi^2(0.005)$	$\chi^2(0.01)$	$\chi^2(0.025)$	$\chi^2(0.05)$	$\chi^2(0.1)$
70	104.2	100.4	95.0	90	85.5

80	116.3	112.3	106.6	101.9	96.6
90	128.3	124.1	118.1	113.1	107.6
100	140.2	135.8	129.6	124.3	118.5

Q5:

Let us define the following random number and the corresponding random variables.

Random number (R)	Random variable= - (1 / 3) *LN(R)
0.1	0.767528
0.23	0.489892
0.61	0.164765
0.32	0.379811
0.46	0.258843
0.567	0.189132
0.29	0.412625
0.83	0.06211
0.44	0.27366
0.16	0.61086

Where

$$R'_i = a + R_i (b - a)$$

$$\omega_i = \frac{\left(\frac{\text{Vol of Layer}}{\text{Total Number of RNs}} \right)}{b - a}$$

Implement **Layer Technique** to improve random variables.

Q6

Answer the following:

- 1 Generate 5 random numbers according to Multiplicative Congruential algorithm.
- 2 Using Chi square to check the following frequency of 100 random numbers:

Class	1	2	3	4	5	6
frequency	10	25	20	10	10	25

Where

And χ^2 Table is define as the following:

ν (DOF)	$\chi^2(0.005)$	$\chi^2(0.01)$	$\chi^2(0.025)$	$\chi^2(0.05)$	$\chi^2(0.1)$
7	20.3	18.5	16.0	14.1	12.0
8	22.0	20.1	17.5	15.5	13.4
9	23.6	21.7	19.0	16.9	14.7
10	25.2	23.2	20.5	18.3	16.0