1st part of question :

Code - ques_4a.m

In order to generate random data with the given PDF distribution , I used the concept of Inverse Transform Sampling. This concept i got prom a wikipedia page whose link i am giving below https://en.wikipedia.org/wiki/Inverse_transform_sampling which describes that we should first find the inverse of the CDF of the given distribution which I described as invCDF function in my code. I have used two if conditions inside the function to consider the two cases x<0 and x>0 because in these two regions the invCDF is different and then we should pass the inverse CDF function random values with uniform distribution in the range [F(a),F(b)] if range of x in original CDF function is [a,b]. So here for x<0 I plug in random values in range [0,0.5] and for x>0, I plug in random values in the range[0.5,1] using rand function.

2nd part of the question :

Code - ques_4b.m

Histogram plot - histogram_4b.png

CDF plot - CDF_4b.png

3rd part of question :

Code - ques_4c.png

As given in problem statement , I considered different X_1, X_2, X_3, X_4, …. and Y =(X_1+ X_2 +....+X_n)/N

The different rows of y refer to different X and I have just sorted the random values to be able to take their average as final

The final matrix contains the final random values with given pdf after taking averages of N random variables with similar pdf

4th part of question :

Histogram plots - histogram_N_2.png
histogram_N_4.png
histogram_N_8.png
histogram_N_16.png
histogram_N_32.png
histogram_N_64.png

The histogram plots can be generated using code - ques_4e.m just by changing the value of N as required(N=2 or 4 or 8 or….)

CDF plot - CDF_final.png

Code for generating CDF plot - ques_4d.png

In the final matrix , I am storing data for values of N ranging from 1 to 64 but in the CDF plot , I considered only the values of N as 2, 4, 8, 16, 32 and 64.