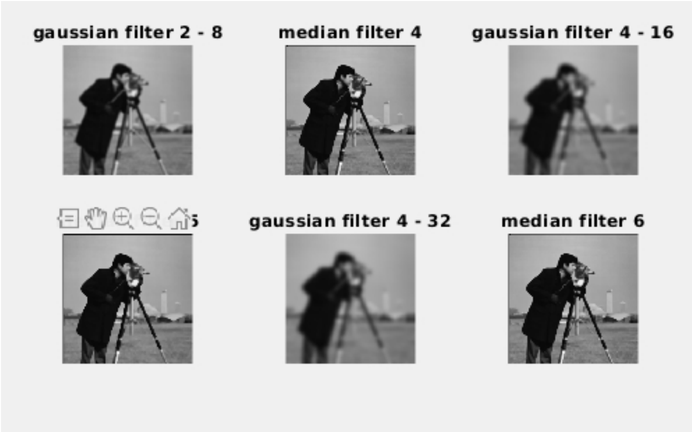
NAME : DEVANSH GUPTA
ROLL NO: 20171100

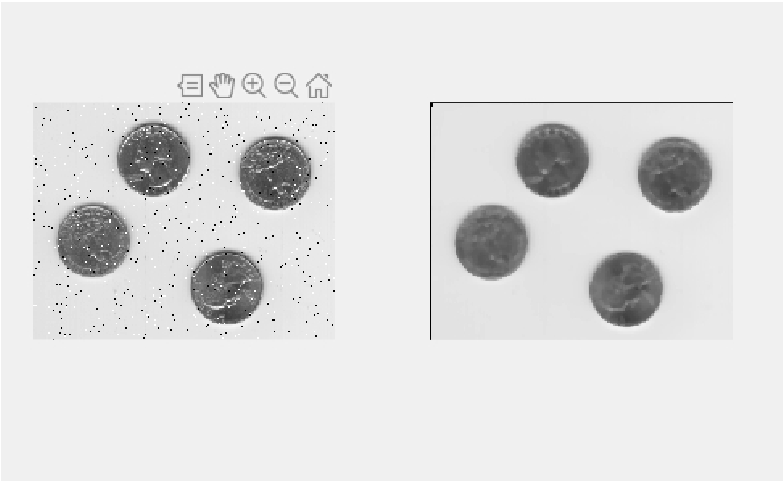
DSAA - ASSIGNMENT 2 REPORT

Q1. (part3)



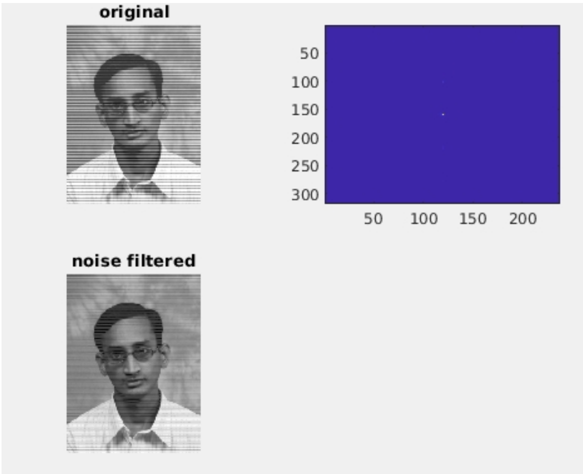
In case of gaussian filter, first no is sigma and 2nd number is the size of the grid.

Q1.(part 4).



Median filter is most suitable. Left one is the original picture and right one is the filtered picture.

Q1.(part 5).



Original image is taken to frequency domain and then it is shifted to align the center spectrum. Then, some frequencies are removed after trial and run. It is then shifted back and converted back to the original domain. This is how the filtered image is retrieved.

Q2.(part 1).

- We have N square filters each of size F. Let the size of the image be (Width, Height,Channels). The convolution is done with a step size of S units, and the input is also padded with a zero padding of Z.

- The size of image after zero padding will be [W + 2Z, H + 2Z, Channels].

- Assuming we zero pad after applying each filter, Now the filter with step length S units applied.
- Hence the output size will be $$
  output width = 1 + floor((Width + 2 * Z - F)/S)
  output height = 1 + floor((Height + 2*Z – F)/S)

- Total convolution in a channel = output width * output height. We will apply this recursively.

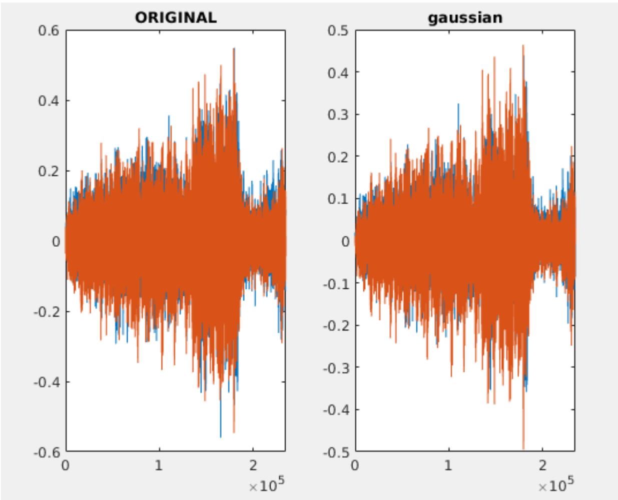
- Let the output of image after (i-1)^th convolution be W_{i-1},H_{i-1}.
  Then W_{i} = floor((W_{i-1} - F + 2*Z)/S) + 1 H_{i} = floor((H_{i-1} - F + 2*Z)/S) + 1

(Part2)

For one convolution:- The number of multiplications at each step is F^2 and the number of additions is F^2-1. The total number of additions and multiplications for one input channel will be (2F^2 -1) * output width * output height.

For N such convolution:
• Number of additions after N convolutions will be ∑{i=0}^{n-1} (W_i * H_i) * (F^2-1) * channels
• Number of multiplications after N convolutions will be $\sum_{i=0}^{ n-1} (W_i * H_i) * F^2 * channels
• Total operations will be ∑{i=0}^{n-1} (W_i * H_i) * (2F^2-1) * channels

Q4. I have used the gaussian filter to denoise the assigned sound.

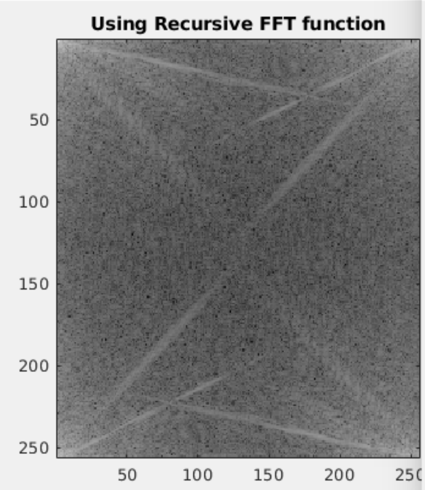


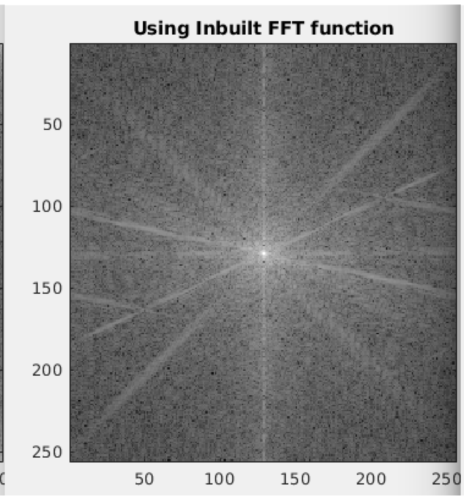
I have used smooth data function to denoise it. First i applied all the available filters with smoothdata function. And after checking all the outputs, gaussian filter suited most. Hence Noise is gaussian in nature.

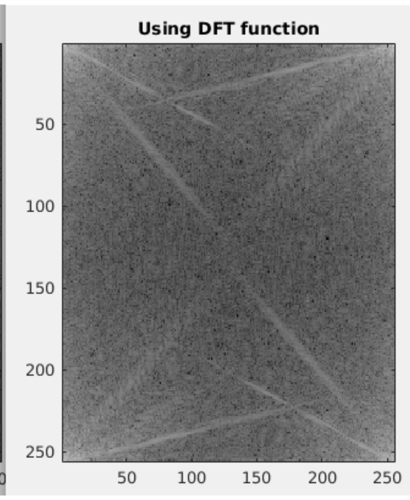
Q5.

Input 1:

Size = 256*256
Name = Cameraman.tif



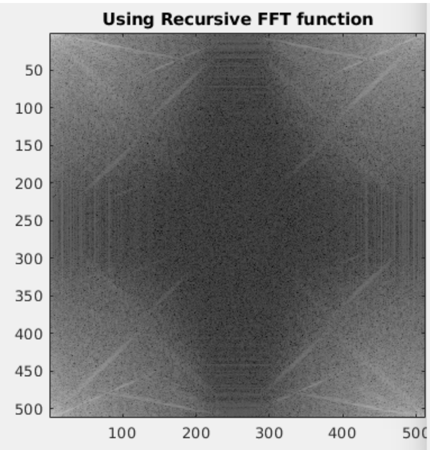


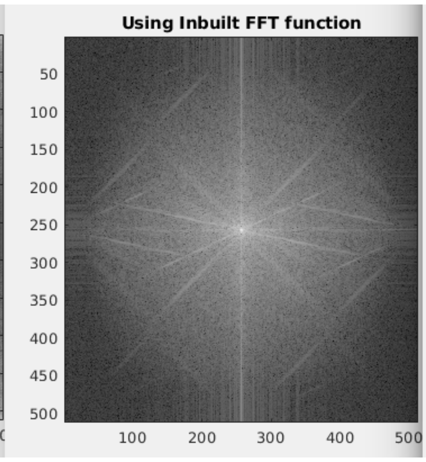


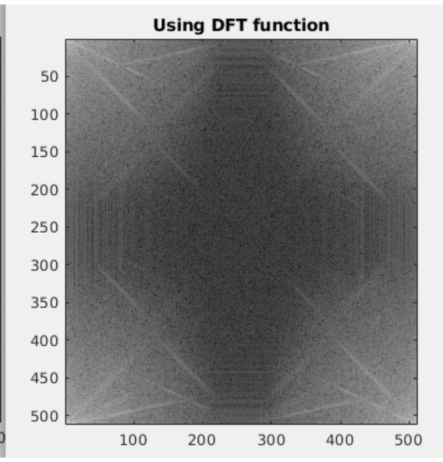
(0.95 secs) (0.06 secs) (0.90 secs)

Input 2:

Size = 512*512
Name = Cameraman.tif



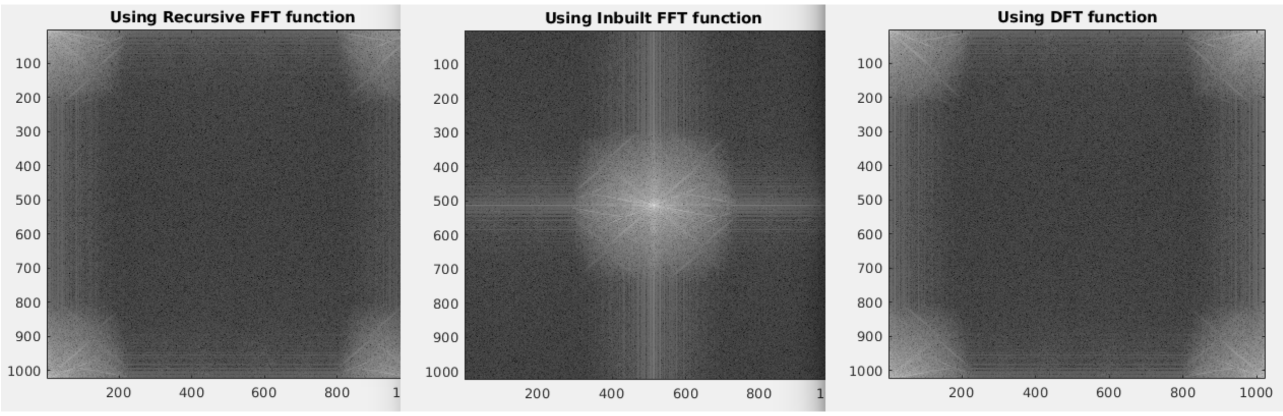




(3.424 secs) (0.06 secs) (7.048 secs)

Input 3:

Size = 1024*1024
Name = Cameraman.tif



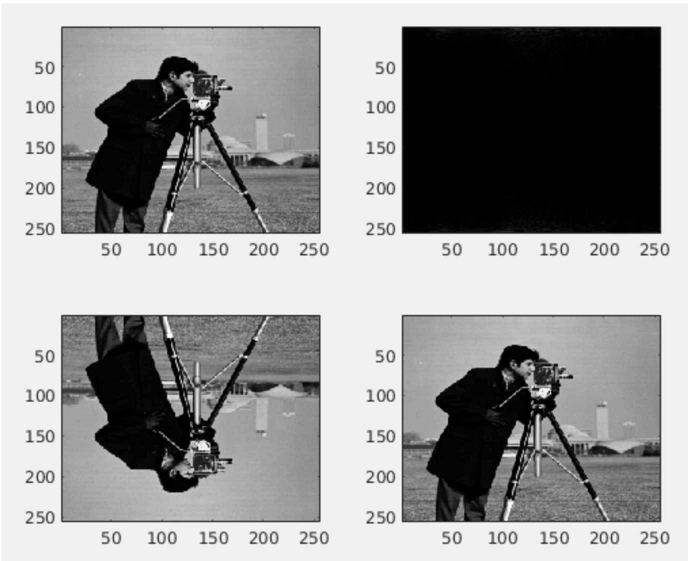
(13.50 secs)   (0.09 secs)   (52.48 secs)

Q6.

On taking fourier transform of the fourier transform of an image, we get the inverted image. Its the DFT property that if you apply DFT twice to the input data , you get the original signal flipped circularly.

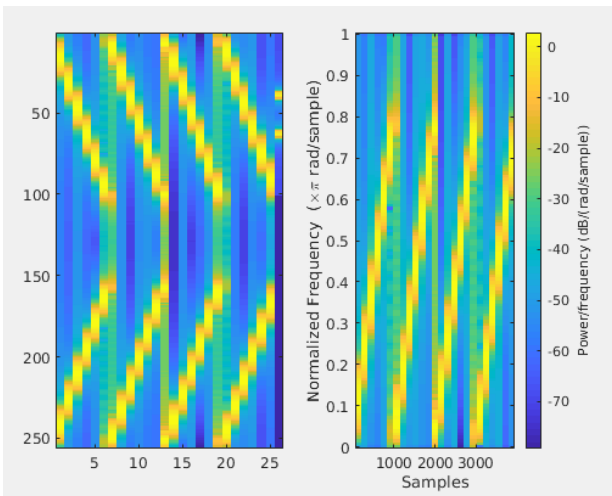
i = sqrt(-1)
i*i = - 1
i*i*i*i = 1

So to get the original signal back ,we again take fourier transform twice of the resultant flipped image.

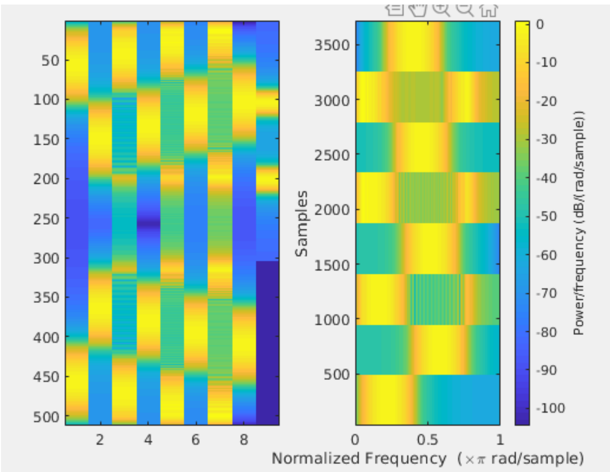


Q7.

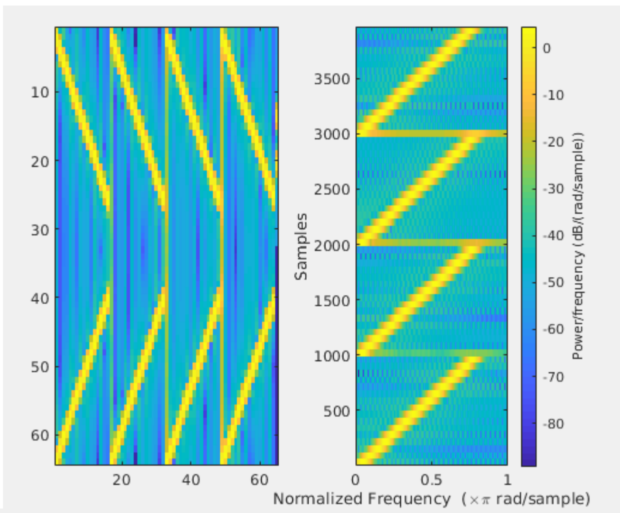
(part 1).



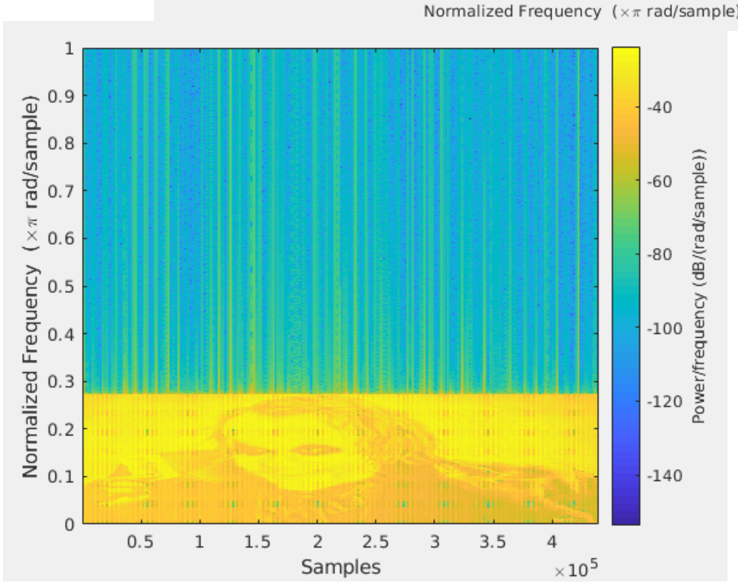
window length = 256
stride length = 100



window size = 512
stride length = 50



window size = 64
stride length = 2



(Part 2)

we use spectrogram for the image processing. After trying numerous

combinations for different values of window size and stride length, 2048 and 32 seemed to give good output.
We can see the image of the joker in the output.

(Part 3)

The picture shown on the right side is the spectrogram of the dialtone corresponding to my roll numberi.e., 20171100.