Assignment-3

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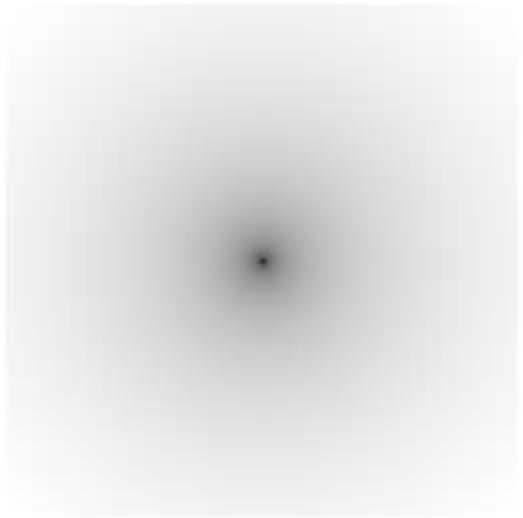
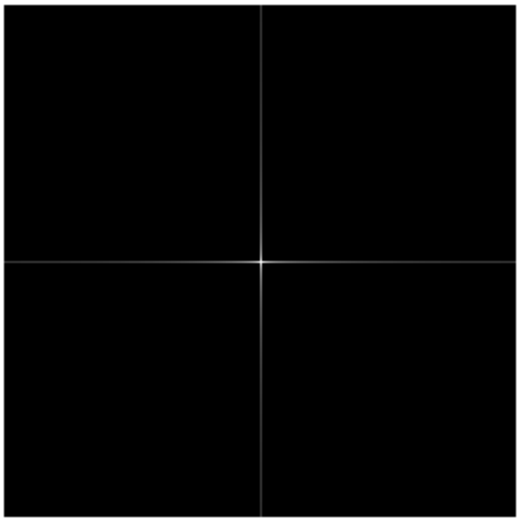
Q1 (b)



Frequency Domain



Time Domain

Type:-'laplacian'
M:-256
N:-256
Do:-20
Function Call:-lpfilter('laplacian',256,256,20)

<u>OBSERVATION:</u> We can see that in the frequency domain the center portion have pixel values 0 and as we move away they keep on increasing and goes closer to or equal to 255.

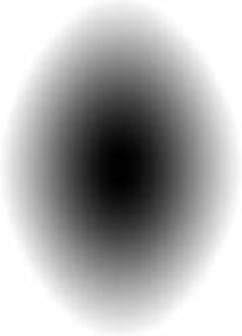
Q2 (b)

<u>Horizontal + Vertical</u>

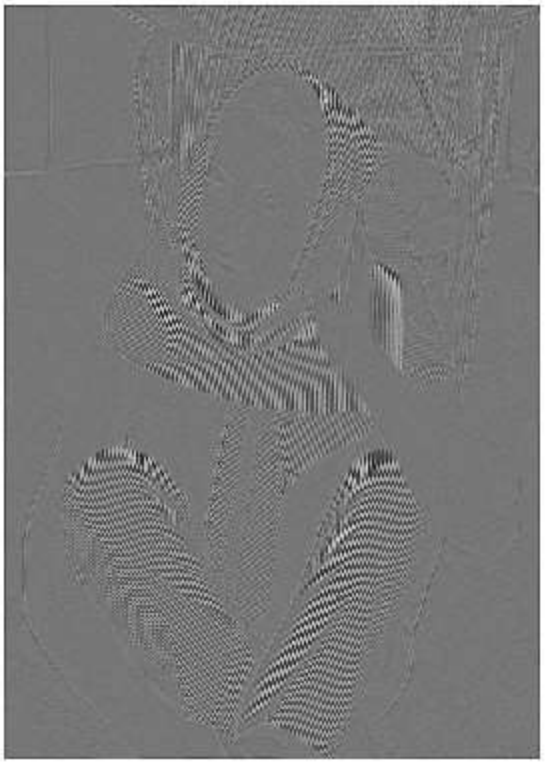
CODE:

```
clear all
close all
clc
```

```
f=imread('barbara.tif');
figure,imshow(f,[])
f=double(f);
% f = (f - min(min(f)))./(max(max(f))-min(min(f)));
M=size(f,1); N=size(f,2); % nr of rows/columns of image f
C=3; D=3; % nr of rows/columns of kernel h
P=M+C-1; Q=N+D-1; % nr of rows/columns after padding
fp=zeros(P,Q); % zero padding: start with zeroes
fp(1:M,1:N)=f; % insert f into image fp
hp=zeros(P,Q); % Construct filter matrix hp, same size as fp.
hp(1,1)=-4; hp(2,1)=1; hp(1,2)=1;hp(2,2)=0; % Center is at (1,1)
hp(P,Q)=0;hp(P,1)=1; hp(P,2)=0;hp(2,Q)=0;hp(1,Q)=1; % Indices modulo P or Q
Fp=fft2(double(fp), P, Q); % FFT of image fp
Hp=fft2(double(hp), P, Q); % FFT of kernel hp
H = fftshift(Hp);
F1 = abs(H); % Get the magnitude
F1 = log(F1+1); % Use log, for perceptual scaling, and +1 since log(0) is
undefined
F1 = mat2gray(F1,[0 1]);
figure,imshow(F1) % Filter
Gp=Fp .* Hp; % Product of FFTs
gp=ifft2(Gp); % Inverse FFT

gp=real(gp); % Take real part
g=gp(1:M, 1:N);
figure,imshow(g,[])

gnorm = g;
gshar = double(f) - gnorm;

figure,imshow(uint8(gshar))
```



Filter in Frequency Domain



Gmask in Time Domain

Sharp Image in Time Domain

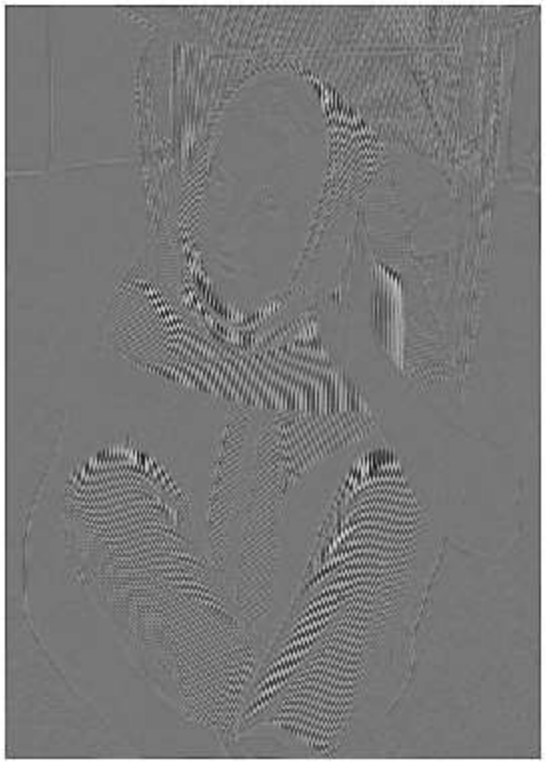
Horizontal + Vertical + Diagonal

CODE:

```
clear all
close all
clc
f=imread('barbara.tif');
figure,imshow(f,[])
f=double(f);
% f = (f - min(min(f)))./(max(max(f))-min(min(f)));
M=size(f,1); N=size(f,2); % nr of rows/columns of image f
C=3; D=3; % nr of rows/columns of kernel h
P=M+C-1; Q=N+D-1; % nr of rows/columns after padding
fp=zeros(P,Q); % zero padding: start with zeroes
fp(1:M,1:N)=f; % insert f into image fp
hp=zeros(P,Q); % Construct filter matrix hp, same size as fp.
```

```
hp(1,1)=-8; hp(2,1)=1; hp(1,2)=1;hp(2,2)=1; % Center is at (1,1)
hp(P,Q)=1;hp(P,1)=1; hp(P,2)=1;hp(2,Q)=1;hp(1,Q)=1; % Indices modulo P or Q
Fp=fft2(double(fp), P, Q); % FFT of image fp
Hp=fft2(double(hp), P, Q); % FFT of kernel hp
H = fftshift(Hp);
F1 = abs(H); % Get the magnitude
F1 = log(F1+1); % Use log, for perceptual scaling, and +1 since log(0) is
undefined
F1 = mat2gray(F1,[0 1]);
figure,imshow(F1) % Filter
Gp=Fp .* Hp; % Product of FFTs
gp=ifft2(Gp); % Inverse FFT

gp=real(gp); % Take real part
g=gp(1:M, 1:N);
figure,imshow(g,[])

gnorm = g;
gshar = double(f) - gnorm;

figure,imshow(uint8(gshar))
```

Filter in Frequency Domain



Gmask in Time Domain

Sharp Image in Time Domain

<u>OBSERVATION:</u>

As we can see when we use H+V+D laplacian filter the output image is much sharper that the image obtained using H+V laplacian filter though due to sharpening in all H,V and D axis the image become so sharp that that the image doesn't seem much pleasant but the image that is sharpened in only H and V axis seems more effective.

As observer from the image of the two filters in the frequency domain, the H+V filter have higher black portion that the H+V+D filter and H+V+D filter id quite circular as we have taken all the 3 axis while the other one is oval because only the H+V axis.

Q3 CODE:

```
clear all
close all
w=imread('barbara.tif');
w=im2double(w);

b=fspecial('motion',7,0);
k = imfilter(w,b);
figure,imshow(k,[])

[M,N] = size(w);
hp = zeros(1132,804);
P = 1132; Q = 804;
hp(1,1)=1/7;hp(1,2)=1/7;hp(1,3)=1/7;hp(1,4)=1/7;
hp(1,5)=1/7;hp(1,6)=1/7;hp(1,7)=1/7;
g = fft2(w,1132,804).*fft2(hp,1132,804);
j=real(ifft2(g));
j=j(1:M, 1:N);
figure,imshow(j,[]);

D=abs(k-j);
disp(max(D(:)));
disp(min(D(:)));
```

Using Command (fspecial)

Without Using Any Command

Max Difference:-0.3597

Min Difference:-0

<u>OBSERVATION:</u> We can see that the difference is less than 0.5 and both the images appear similar.

<u>NOTE:-Solution to rest all questions and parts is in hard copy.</u>