(i)

clc;

clear all;

close all;

i = imread('image6.jpg');

i = rgb2gray(i);

[m,n] = size(i);

N = 7;%mask size

n\_i = imnoise(i,'gaussian');

subplot(3,1,1)

imshow(i,[]);

title('Orginal')

%figure;

subplot(3,1,2);

imshow(n\_i,[]);

title('Image with AGWN');

%padding with ones

I = ones(m+N-1,n+N-1);

I((N+1)/2:m+(N-1)/2,(N+1)/2:n+(N-1)/2) = n\_i;

%calculate geometric mean

for i=1:m

    for j=1:n

        x = I(i:i+N-1,j:j+N-1);

        G\_m\_filter(i,j) = [prod(x,'all')]^(1/N^2);

    end

end

%figure;

subplot(3,1,3)

imshow(G\_m\_filter,[]);

title(sprintf('After geometric mean filtering with mask size of %d',N));

(ii)

clc;

clear all;

close all;

I = imread('image6.jpg');

I=rgb2gray(I);

[m,n] = size(I);

N = 3;%mask size

subplot(3,1,1)

imshow(I,[]);

title('Orginal')

%adding salt noise

prob = 0.04\*100;

n\_i = I;

rmatrix = randi([0,255],m,n);

n\_i(rmatrix >prob/2 & rmatrix<prob) = 255;

subplot(3,1,2);

imshow(n\_i,[]);

title('Image with salt noise');

%padding with zeros

I = zeros(m+N-1,n+N-1);

I((N+1)/2:m+(N-1)/2,(N+1)/2:n+(N-1)/2) = n\_i;

%harmonic mean filter

for i=1:m

    for j=1:n

        x = I(i:i+N-1,j:j+N-1);

        for u=1:size(x,1)

           for v=1:size(x,2)

               X1(u,v) = 1/x(u,v);

           end

        end

        H\_m\_filter(i,j) = (N\*N)/sum(X1,'all');%N\*N/sum(x,'all');

    end

end

subplot(3,1,3);

imshow(H\_m\_filter,[]);

title('Image after applying harmonic mean filter');

(iii)

clc;

clear all;

close all;

I = imread('image6.jpg');

I = rgb2gray(I);

[m,n] = size(I);

N = 3;%mask size

Q = -1.5;%positive Q for eliminating pepper noise

         %Negative Q for eliminating salt noise

subplot(3,1,1);

imshow(I,[]);

title('Orginal');

%Adding salt noise

prob = 0.1\*100;

n\_i = I;

rmatrix = randi([0,255],m,n);

n\_i(rmatrix >prob/2 & rmatrix<prob) = 255; % for salt noise

%n\_i(rmatrix <prob/2)=0;  % for pepper noise

subplot(3,1,2)

imshow(n\_i,[]);

title('Image with salt noise');

%padding with zeros

I = zeros(m+N-1,n+N-1);

I((N+1)/2:m+(N-1)/2,(N+1)/2:n+(N-1)/2) = n\_i;

%calculate contra harmonic mean filter

for i=1:m

    for j=1:n

        x = I(i:i+N-1,j:j+N-1);

        for u=1:size(x,1)

            for v=1:size(x,2)

                X1(u,v) = x(u,v)^(Q+1);

            end

        end

        for u=1:size(x,1)

           for v=1:size(x,2)

               X2(u,v) = x(u,v)^(Q);

           end

        end

        contra\_H\_m\_filter(i,j) = sum(X1,'all')/sum(X2,'all');

    end

end

subplot(3,1,3)

imshow(contra\_H\_m\_filter,[]);

title('Image after applying contra harmonic mean filter');

