Institute of Distance and Open Learning

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CERTIFICATE

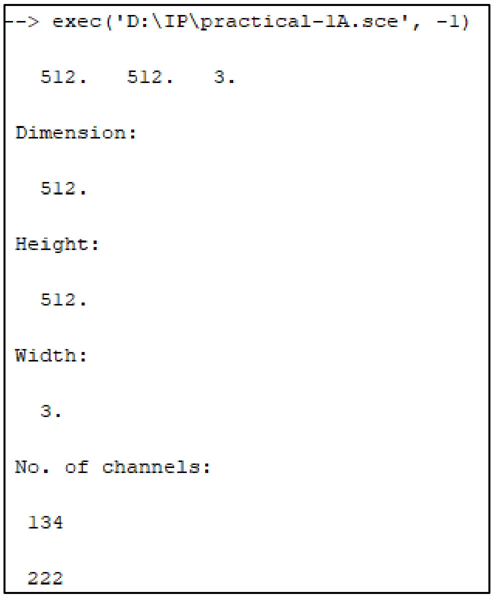
This is to certify that **Mr. Omkar B Auti** of **Master in Computer Application** (MCA) Semester I has completed the specified term work in the subject of **Image Processing** satisfactorily within this institute as laid down by University of Mumbai during the academic year 2023 to 2024.

Subject In-charge External Examiner Coordinator – M.C.A

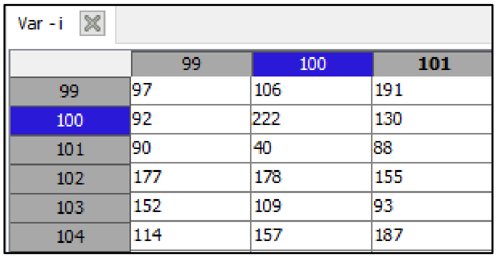
IP INDEX

1. **Basics**
    a. Program to access image properties – Dimension, height, width, number of channels, image size, accessing and modifying any pixel

```
clear all;

i = imread("D:\IP\images\baboon.png")
imshow(i);

s= size(i);
disp("Dimension: ", s)
disp("Height: ", s(1));
disp("Width: ", s(2))
disp("No. of channels: ", s(3));
disp(i(100,100));
i(100,100) = 222;
disp(i(100,100));
```



```
--> exec('D:\IP\practical-1A.sce', -1)

  512.   512.   3.

Dimension:

  512.

Height:

  512.

Width:

  3.

No. of channels:

 134

 222
```

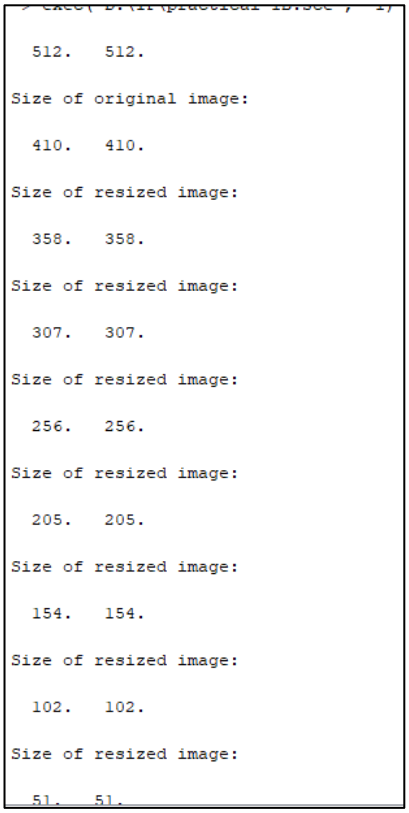


	99	100	101
99	97	106	191
100	92	222	130
101	90	40	88
102	177	178	155
103	152	109	93
104	114	157	187

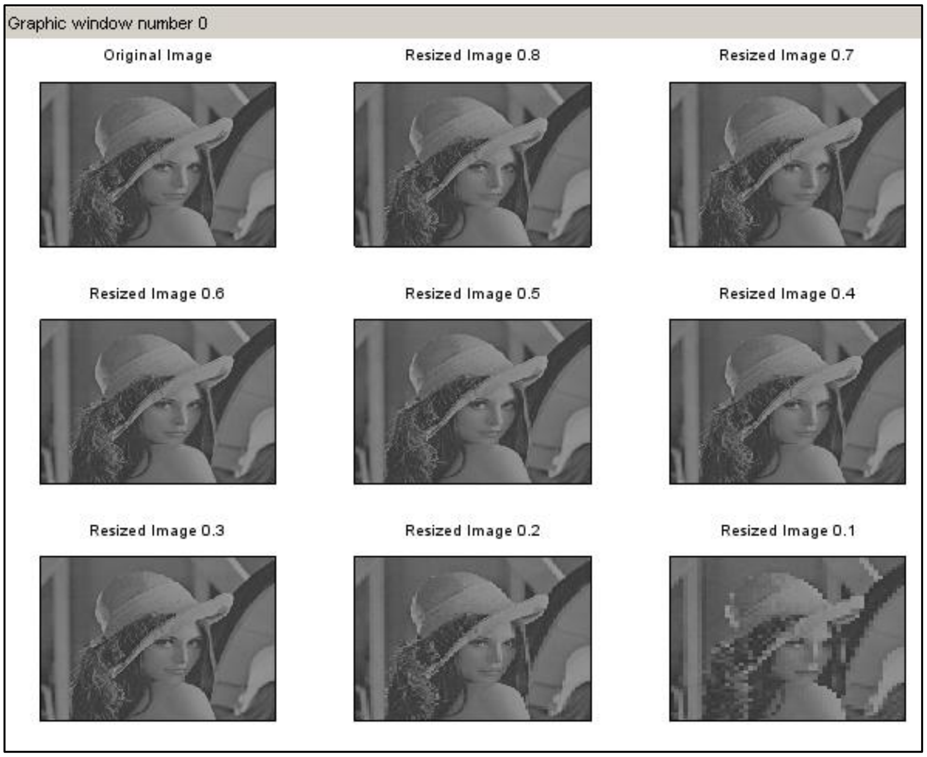
b. Program to study the effects of reducing the spatial resolution of a digital image

```
i = imread("D:\IP\images\Lena_dark.png")
disp("Size of original image: ", size(i));

subplot(3,3,1);
imshow(i);
title("Original Image");

j1 = imresize(i, 0.8);
disp("Size of resized image: ", size(j1));
subplot(3,3,2);
```

```
imshow(j1);
title("Resized Image 0.8");

j2 = imresize(i, 0.7);
disp("Size of resized image: ", size(j2));
subplot(3,3,3);
imshow(j2);
title("Resized Image 0.7");

j3 = imresize(i, 0.6);
disp("Size of resized image: ", size(j3));
subplot(3,3,4);
imshow(j3);
title("Resized Image 0.6");

j4 = imresize(i, 0.5);
disp("Size of resized image: ", size(j4));
subplot(3,3,5);
imshow(j4);
title("Resized Image 0.5");

j5 = imresize(i, 0.4);
disp("Size of resized image: ", size(j5));
subplot(3,3,6);
imshow(j5);
title("Resized Image 0.4");

j6 = imresize(i, 0.3);
disp("Size of resized image: ", size(j6));
subplot(3,3,7);
imshow(j6);
title("Resized Image 0.3");

j7 = imresize(i, 0.2);
disp("Size of resized image: ", size(j7));
subplot(3,3,8);
imshow(j7);
title("Resized Image 0.2");

j8 = imresize(i, 0.1);
disp("Size of resized image: ", size(j8));
subplot(3,3,9);
imshow(j8);
title("Resized Image 0.1");
```



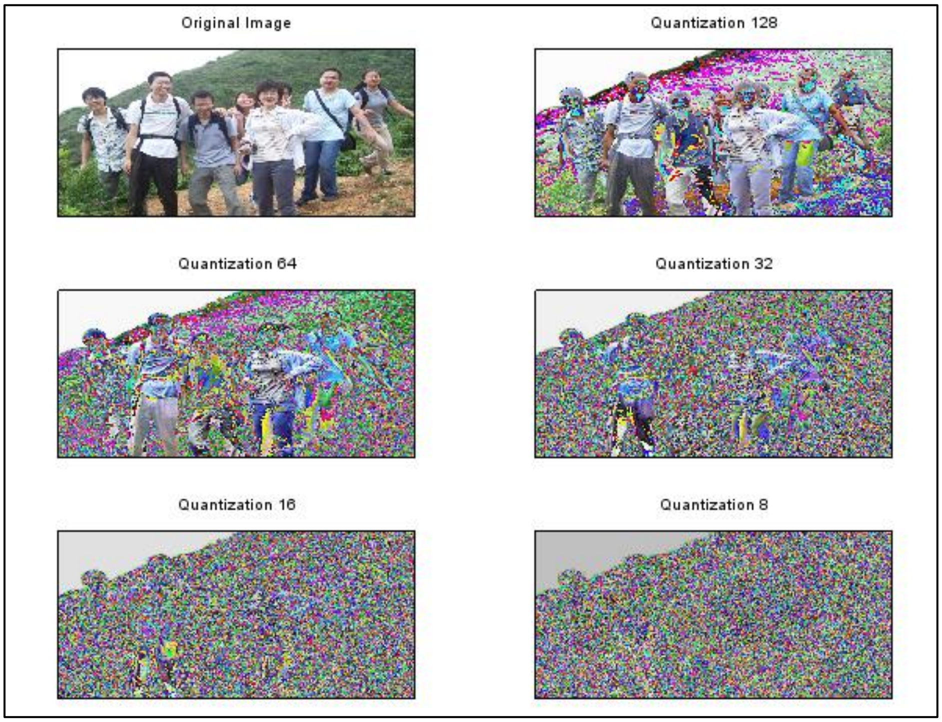
```
> exec('D:\IP\practical 1b.sce', -1)

  512.   512.

Size of original image:

  410.   410.

Size of resized image:

  358.   358.

Size of resized image:

  307.   307.

Size of resized image:

  256.   256.

Size of resized image:

  205.   205.

Size of resized image:

  154.   154.

Size of resized image:

  102.   102.

Size of resized image:

  51.   51.
```



c. Program to study the effects of varying the number of intensity levels in a digital image

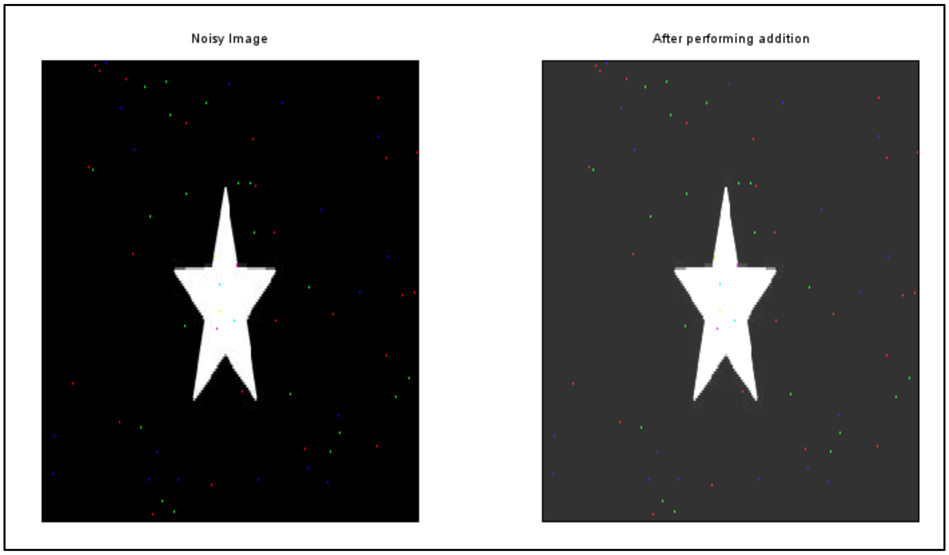
```
i = imread("D:\IP\images\people.jpg")
subplot(3,2,1);
imshow(i);
title("Original Image");

i = double(i);

k1 = (i*255)/128;
subplot(3,2,2);
imshow(uint8(k1));
title("Quantization 128");

k2 = (i*255)/64;
subplot(3,2,3);
k2 = uint8(k2);
imshow(k2);
title("Quantization 64");

k3 = (i*255)/32;
subplot(3,2,4);
```

```
imshow(uint8(k3));
title("Quantization 32");

k4 = (i*255)/16;
subplot(3,2,5);
imshow(uint8(k4));
title("Quantization 16");

k5 = (i*255)/8;
subplot(3,2,6);
imshow(uint8(k5));
title("Quantization 8");
```



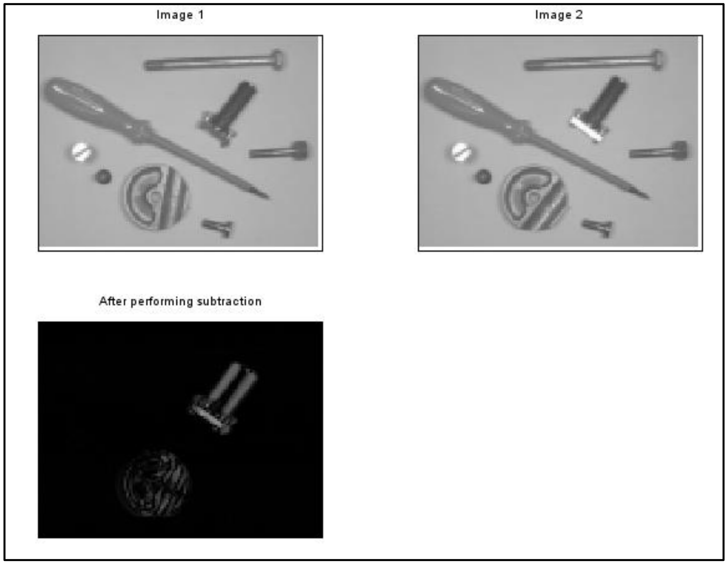
d. Program to perform image addition for noise reduction.

```
i = imread("D:\IP\images\image3.JPG")
i = imnoise(i, 'salt & pepper', 0.001);
subplot(1,2,1);
imshow(i);
title("Noisy Image");

k = imadd(i, 50);
subplot(1,2,2);
imshow(k);
title("After performing addition");
```



e. Program to compare images using subtraction for enhancing the difference between images

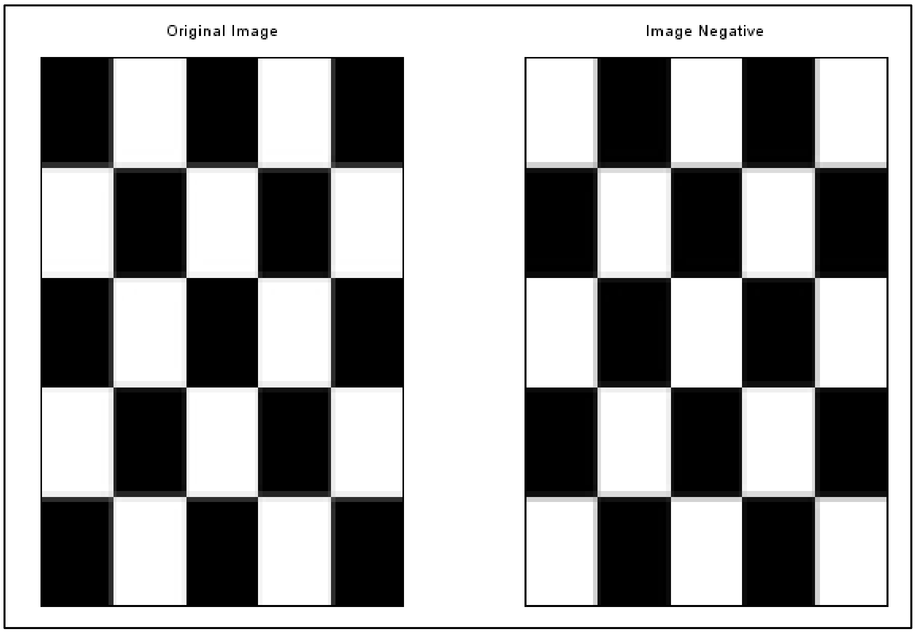
```
i = imread("D:\IP\images\tool1.png")
j = imread("D:\IP\images\tool2.png");
subplot(2,2,1);
imshow(i);
title("Image 1");
subplot(2,2,2);
imshow(j);
title("Image 2");

k = imabsdiff(i, j);
subplot(2,2,3);
imshow(k);
title("After performing subtraction");
```



2. Basic Intensity Transformation functions

a. Image Negative

```
i = imread("D:\IP\images\checkerbox.png");
c = 255; //L-1
b = c-i; //L-1-r (r = intensity)

subplot(1,2,1);
imshow(i);
title("Original Image");

subplot(1,2,2);
imshow(b);
title("Image Negative");
```

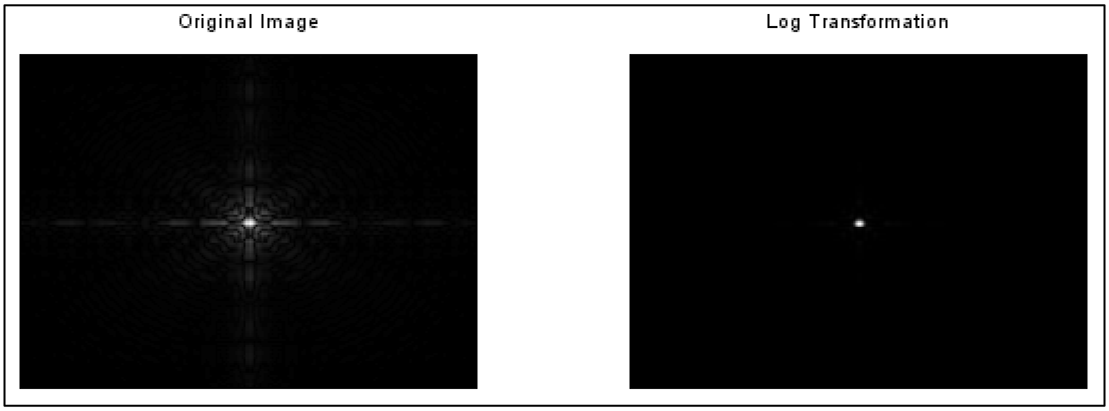


b. Thresholding

```
clear all;
img = imread("D:\IP\images\puffin.png");
subplot(1,2,1);
imshow(i);
title("Original Image");

z = double(img);
[row col] = size(img);
k = 50;
for i = 1:1:row
    for j = 1:1:col
    if((z(i,j) > k ))
      z(i,j) = 255;
    else
      z(i,j) = 0;
end
end
end

subplot(1,2,2);
imshow(uint8(z));
title("Thresholding");
```

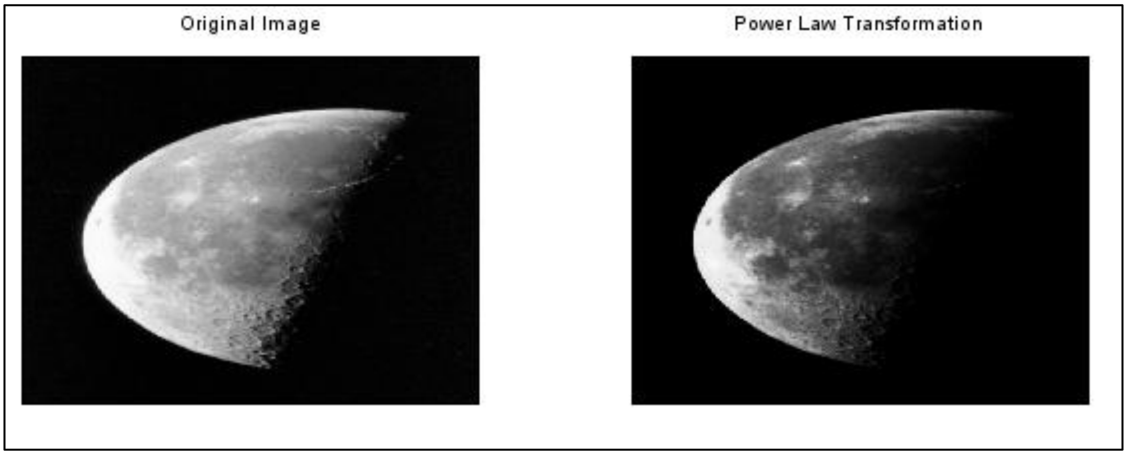
c. Log Transformation

```
clear all;
i = imread("D:\IP\images\log.tif");
r = double(i)/255;
c = 1; //constant
gamma = 3;
s = c * r.^gamma;

subplot(2,2,1);
imshow(i);
title("Original Image");

subplot(2,2,2);
imshow(s);
title("Log Transformation");
```



```
clear all;
i = imread("D:\IP\images\moon.tif");
r = double(i)/255;
c = 1; //constant
```

```
gamma = 3;
s = c * r.^gamma;

subplot(2,2,1);
imshow(i);
title("Original Image");

subplot(2,2,2);
imshow(s);
title("Power Law Transformation");
```



Original Image

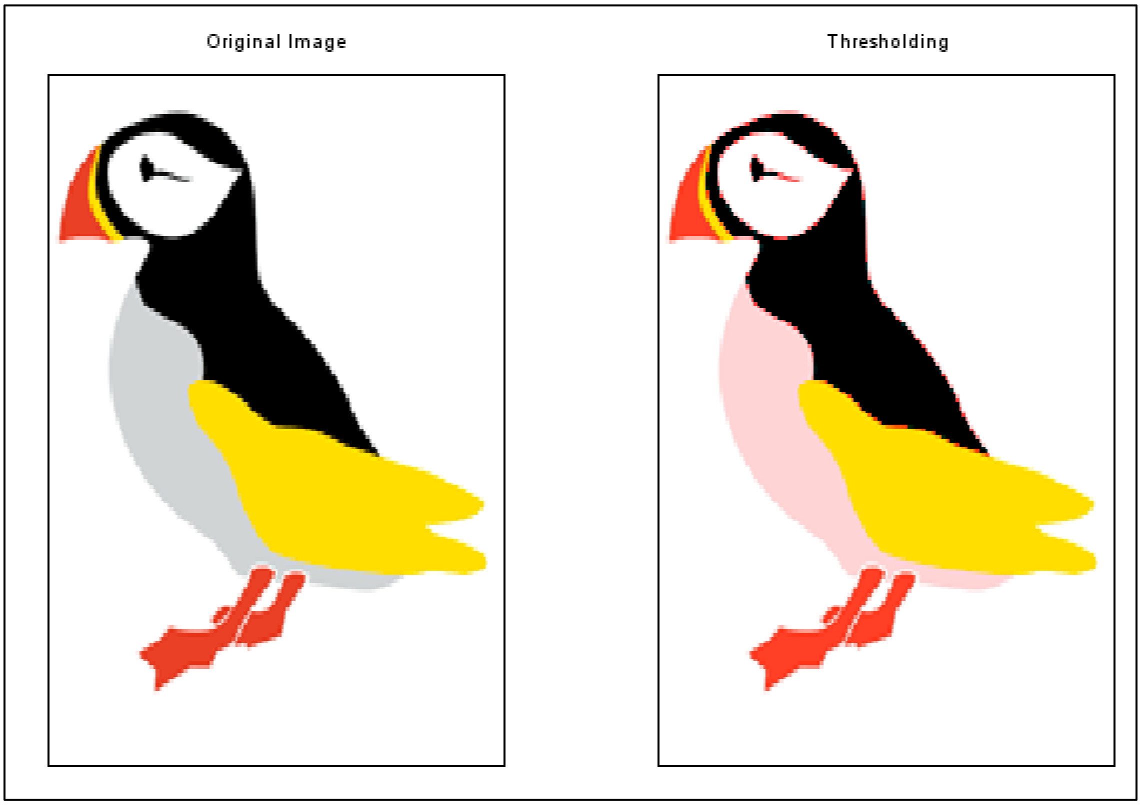
Power Law Transformation

d. Gray Level Slicing

a. With background

```
clear all;
img = imread("D:\IP\images\seed.tif");
subplot(1,2,1);
imshow(i);
title("Original Image");

z = double(img);
[row col] = size(img);

for i = 1:1:row
    for j = 1:1:col
        if((z(i,j) > 50 ) && (z(i,j) < 100))
            z(i,j) = 200;
        else
            z(i,j) = img(i,j);
end
end
end
```

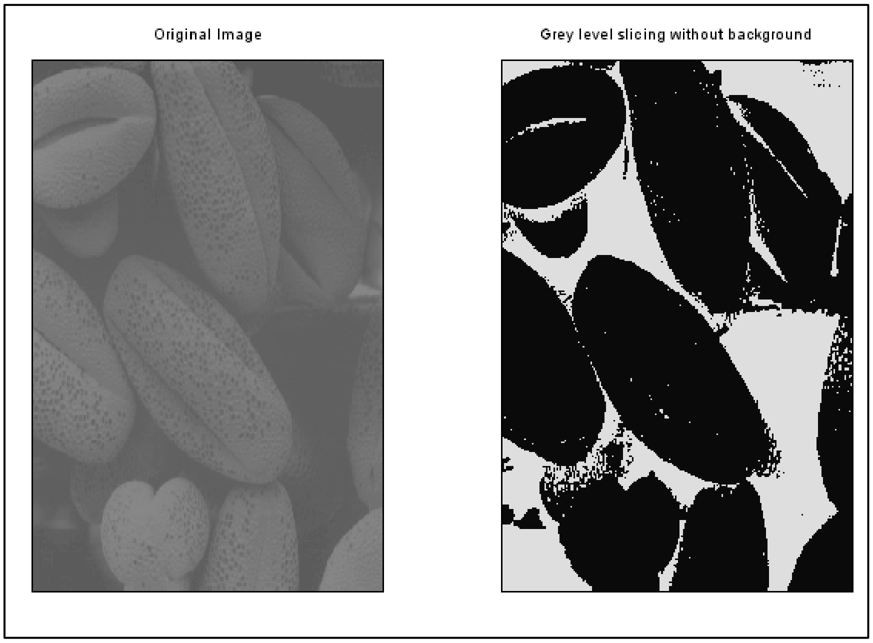
```
subplot(1,2,2);
imshow(uint8(z));
title("Grey level slicing with background");
```



b. Without Background

```
clear all;
img = imread("D:\IP\images\seed.tif");
subplot(1,2,1);
imshow(i);
title("Original Image");

z = double(img);
[row col] = size(img);

for i = 1:1:row
    for j = 1:1:col
        if((z(i,j) > 50 ) && (z(i,j) < 100))
            z(i,j) = 222;
        else
            z(i,j) = 10;
end
end
end
```

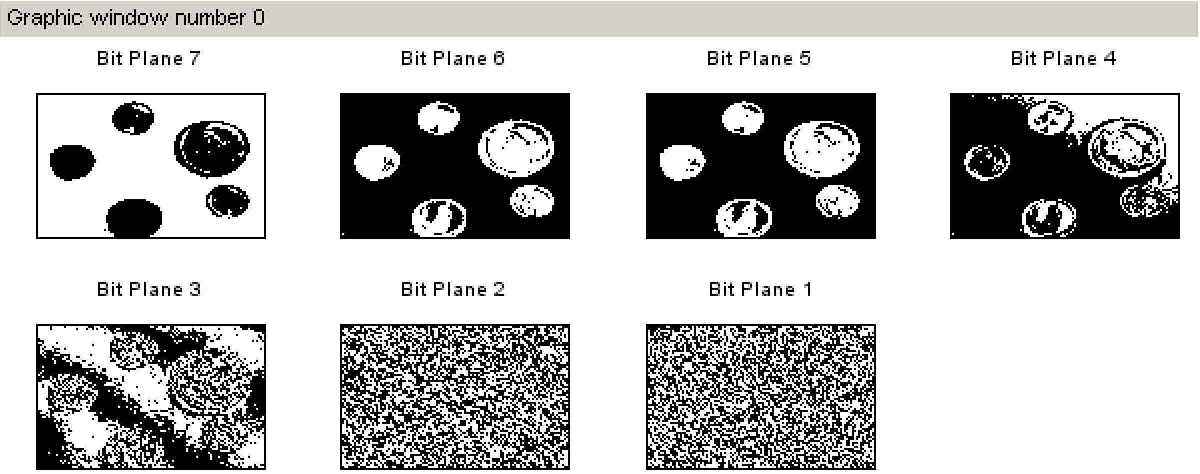
```
subplot(1,2,2);
imshow(uint8(z));
title("Grey level slicing without background");
```



e. Bit Plane Slicing

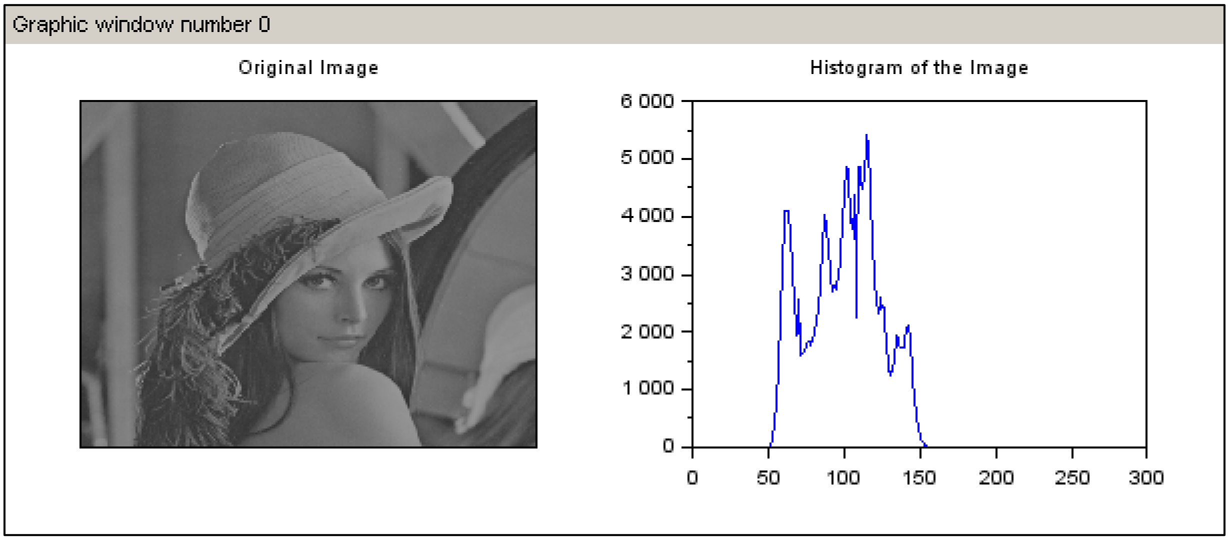
```
clear all;

//i = imread("D:\IP\images\checkerbox.png");
img = imread("D:\IP\images\coins.png");
[r,c] = size(img);
for i = 1:r
    for j = 1:c
        MSB(i,j) = bitand(img(i, j), bin2dec('10000000'));
        LSB(i,j) = bitand(img(i, j), bin2dec('00000001'));
        Second(i,j) = bitand(img(i, j), bin2dec('01000000'));
        Third(i,j) = bitand(img(i, j), bin2dec('001000000'));
        Fourth(i,j) = bitand(img(i, j), bin2dec('000100000'));
        Fifth(i,j) = bitand(img(i, j), bin2dec('00001000'));
        Sixth(i,j) = bitand(img(i, j), bin2dec('00000100'));
        Seventh(i,j) = bitand(img(i, j), bin2dec('000000010'));
end
end

subplot(4,4,1);
imshow(MSB);
title("Bit Plane 7");
```

```
subplot(4,4,2);
imshow(Second);
title("Bit Plane 6");

subplot(4,4,3);
imshow(Third);
title("Bit Plane 5");

subplot(4,4,4);
imshow(Fourth);
title("Bit Plane 4");

subplot(4,4,5);
imshow(Fifth);
title("Bit Plane 3");

subplot(4,4,6);
imshow(Seventh);
title("Bit Plane 2");

subplot(4,4,7);
imshow(LSB);
title("Bit Plane 1");
```



3. Program to plot Histogram
    a. Program to plot Histogram of an image

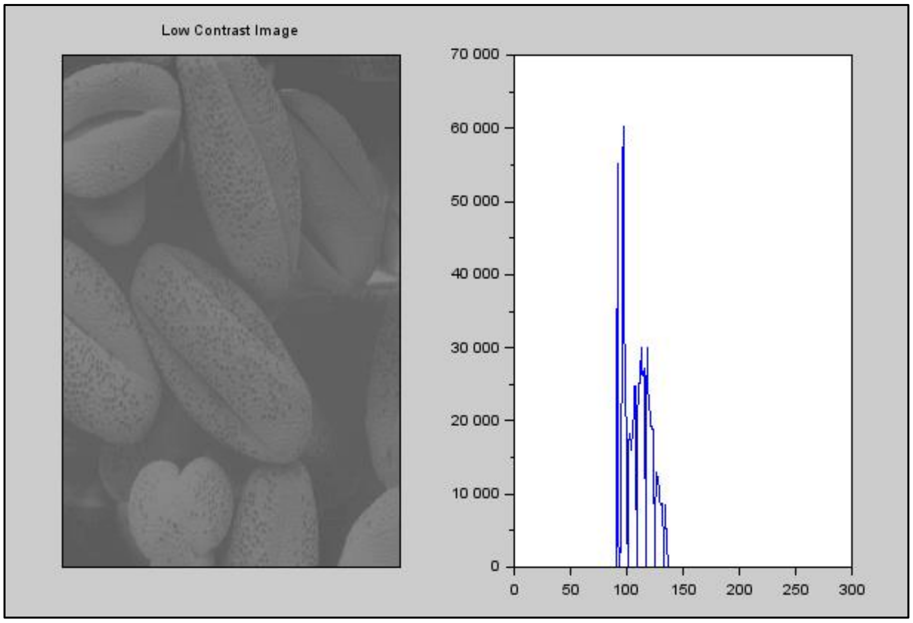
```
clc;
clear;
a = imread("D:\IP\images\Lena_dark.png");
subplot(2,2,1);
imshow(a);
title("Original Image");

[r,c] = size(a);
h = zeros(1,256); //array of zeroes to store count of different intensities
for i=1:r
    for j=1:c
        if (a(i,j) == 0)
            a(i,j) = 1;
        end
        k = a(i,j);
        h(k) = h(k) + 1;
    end
end

subplot(2,2,2);
plot(h);
title("Histogram of the Image");
```



b. Program to plot Histogram of Low Contrast, Bright, dark and High Contrast Images

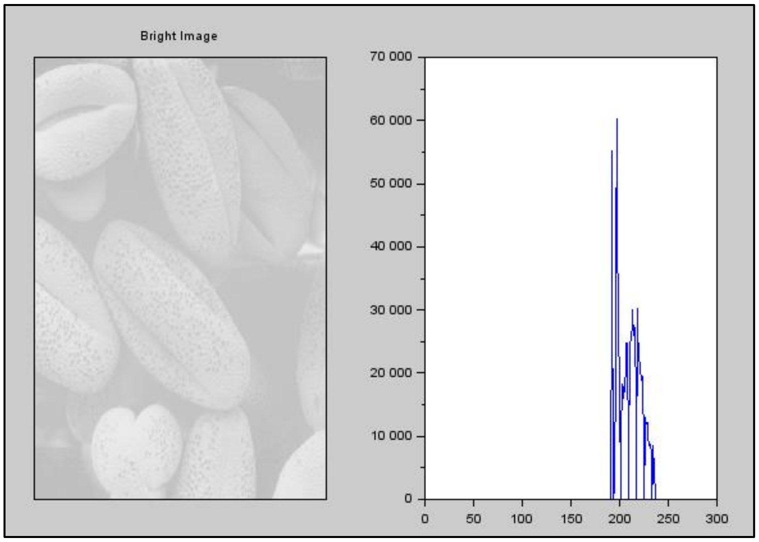
Low Contrast –

```
clear all;
figure;
a=imread("D:\IP\images\seed.tif");
subplot(1,2,1);
imshow(a);
title("Low Contrast Image");
subplot(1,2,2);
h2=imhist(a);
plot(h2);
```



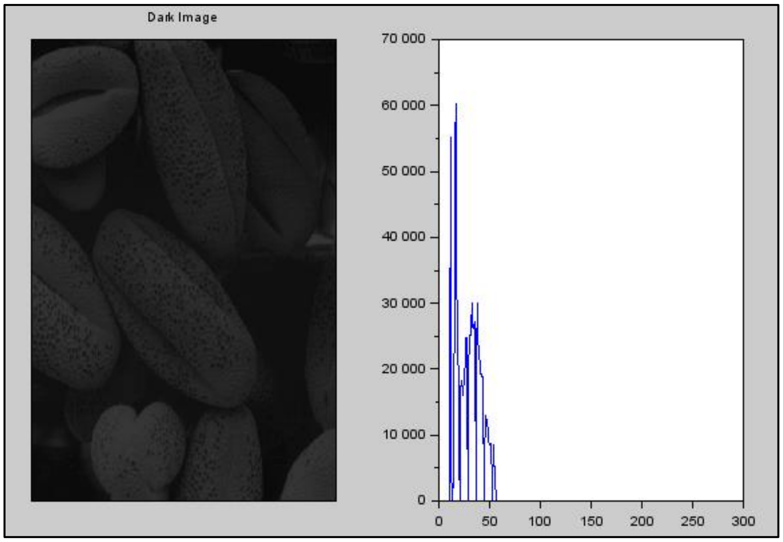
Bright Image –

```
clear all;
a=imread("D:\IP\images\seed.tif");

figure;
a=a+100;
subplot(1,2,1);
imshow(a);
title("Bright Image");
subplot(1,2,2);
h3=imhist(a);
plot(h3);
```



Dark Image –

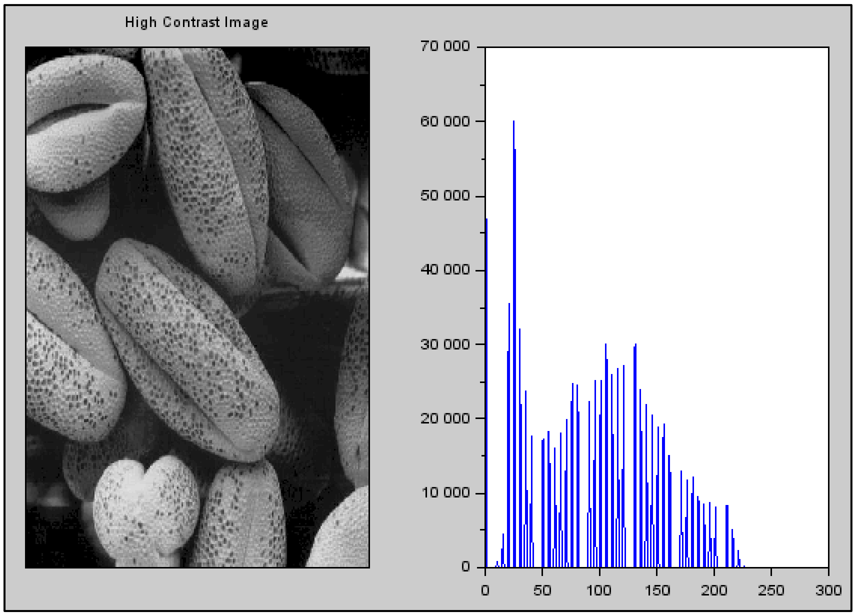
```
clear all;
figure;
a=imread("D:\IP\images\seed.tif");

a=a-80;
subplot(1,2,1);
imshow(a);
title("Dark Image");
subplot(1,2,2);
h3=imhist(a);
plot(h3);
```



High Contrast Image –

```
clear all;
```

```
figure;
a=imread("D:\IP\images\seed.tif");

mmin = min(a(:));
mmax = max(a(:));
lmin = 0;
lmax = 255;

a1 = (a-mmin) * ((lmax-lmin)/(mmax-mmin))+lmin;
subplot(1,2,1);
imshow(a1);
title("High Contrast Image");
subplot(1,2,2);
h5=imhist(a1);
plot(h5);
```



4. Image Smoothing in Spatial Domain
    a. Averaging
    b. Min Filter
    c. Max Filter
    d. Median Filter

```
clc;
clear all;

a = imread("D:\IP\images\moon.tif");
c = imnoise(a, 'gaussian', 0.003);
d=double(a);
b=d;

[r,c] = size(a);
for i=2:r-1
    for j=2:c-1
        a1 = d(i-1,j-1) + d(i-1,j) + d(i-1,j+1) + d(i,j-1) + d(i,j) +
d(i,j+1) + d(i+1,j-1) + d(i+1,j) + d(i+1,j+1);
        b(i,j) = a1*(1/9);
    end
end

subplot(1,3,1);
imshow(a);
title("Original Image");
subplot(1,3,2);
imshow(c);
title("Noisy image");

subplot(1,3,3);
imshow(uint8(b));
title("Filtered image");
```

5. Image Sharpening in Spatial Domain
    a. First Order derivative
    b. Second Order Derivative