Assignment 2, Monsoon 2019
Deadline 6th sept Friday 4:00PM
Total marks # 10

Q1, Q3-b, Q4, Q5 are theory questions.

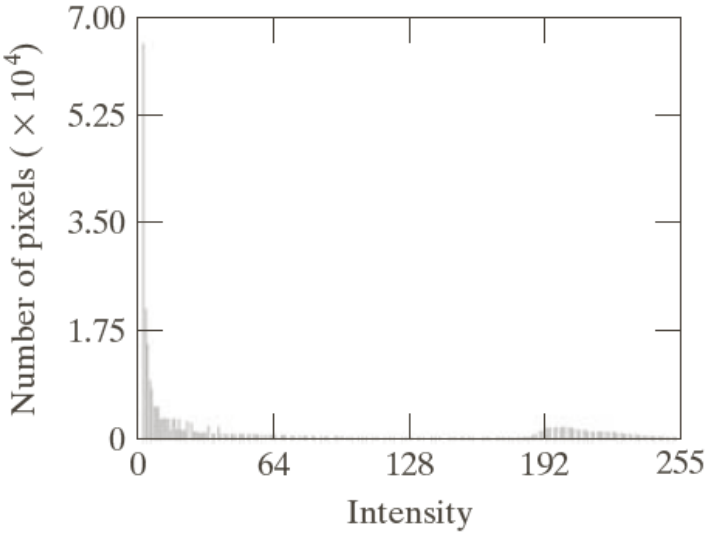
Q1. Find the convolution w*I [2]

w = [1 0 0;
0 0 0;
0 0 -1];

I = [1 0;
0 1];

You need to show all the computation steps. Assume the center of w is origin. For I, the origin starts at left-topmost pixel. Output is of 4x4.

Q2. For the following [2]



compute histogram matched image. You first need to specify a histogram. No histogram matching libraries are supposed to be used.

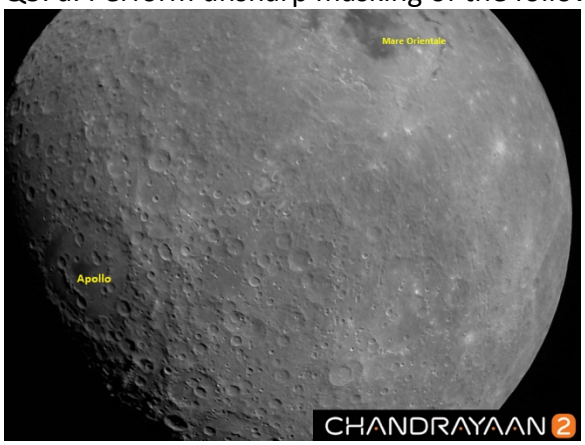
For obtaining the specified histogram also, no image enhancement libraries such as contrast enhancement functions are supposed to be used. You can specify your own histogram.

In doing so, you may not obtain a good specified histogram and hence the output image may not be as intended. However, this is fine.

The histogram given in the image above is that of the input image.

You need to plot specified histogram, output image and its histogram.

Q3. a. Perform unsharp masking of the following image [2]

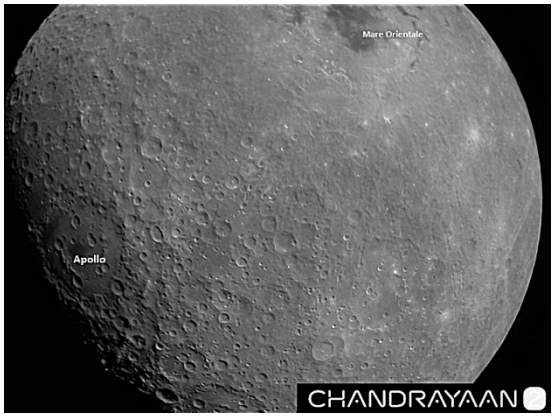


Use box filter of size 7x7 to obtain blur filter. You can use any convolution library to obtain the blurred image. You cannot use a standard filter which takes only image and filter as input and gives back blurred image as output. Convert image into double or float before performing convolution.

Ensure that you only pick the size of the image from the output of the convolution. You must pick this from the center of the output.

Obtain the unsharp mask by subtracting the blurred image from original image.

Add this mask to original image to obtain unsharp mask. You will obtain the output image like this



b. Express unsharp masking in one step process as $f(x,y) * w(x,y)$ and show the value of filter $w(x,y)$. [1]

c. Write a code which uses filter in part b. Use convolution to perform filtering. [1]

Compare unsharp masked image obtained with that of (a). Comment whether they look similar or not.

Q4. Find inverse Fourier transform of [1]

$$\delta(\omega - k\omega_0) + \delta(\omega + k\omega_0)$$

Q5. Find 2-D Fourier transform of $\delta(2t, 2z)$. [1]