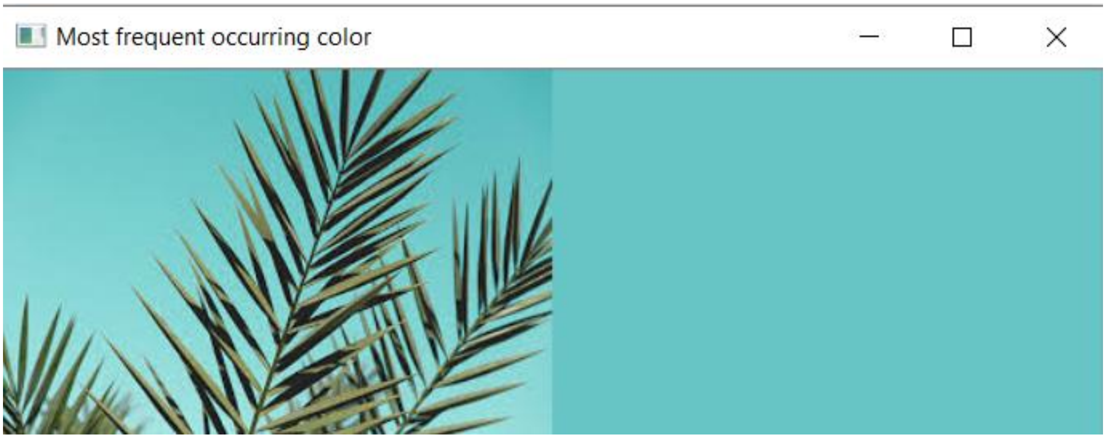
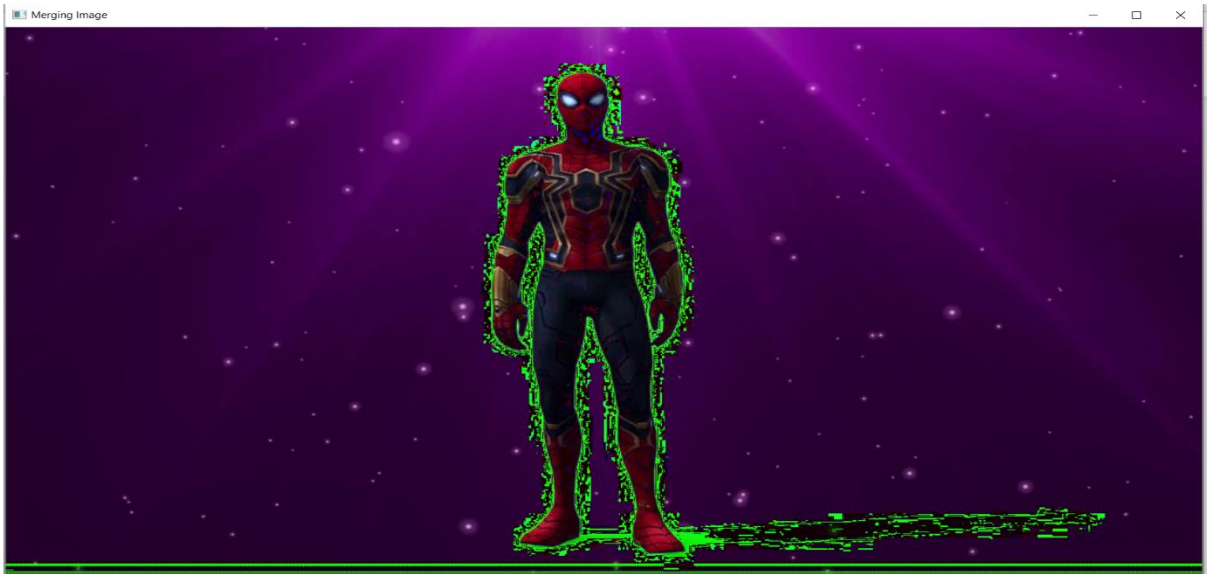
Q1. 1)


Most frequent occurring color

Q1. 2)

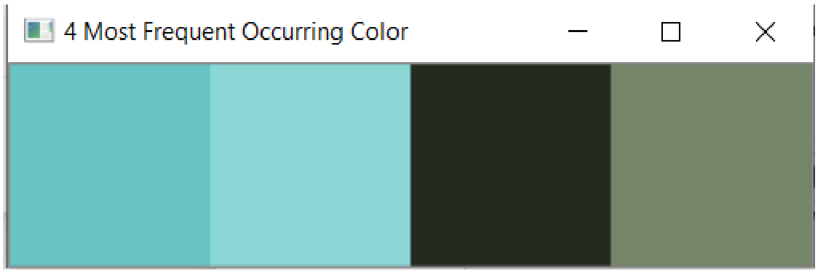

Merging Image

Q1. 3)


Merging Image

Q2. 1)

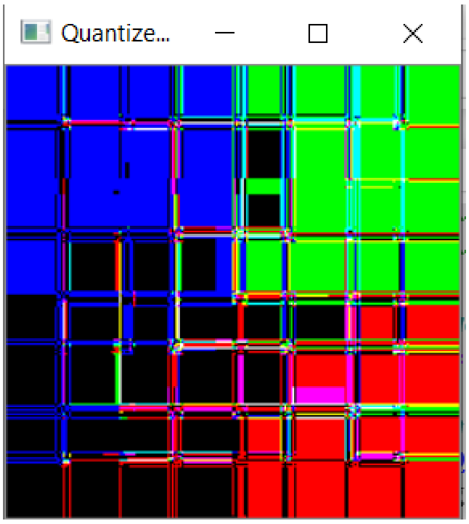
Q2. 2)



Q2. 3) Use your function on multiple images and argue why the effect is more on some images while it is not that apparent on the others?

→ Contrast stretching attempts to improve an image by stretching its intensity values. When an image contains varied range of values then more effect can be seen on that image. When an image contains full set of value eg:- 0, 255 then contrast stretching will have least impact. And outliers can also reduce the effectiveness of contrast stretching.

Q3. 1)

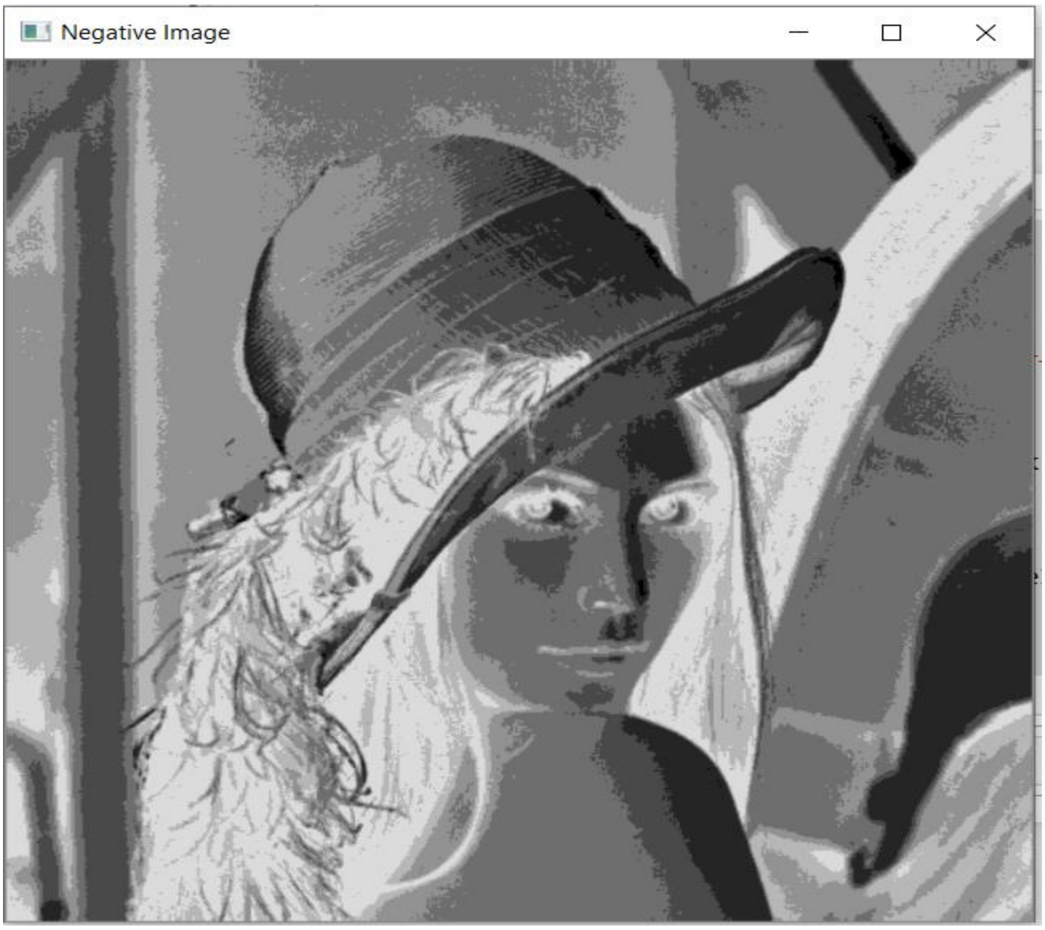


Q3. 2)

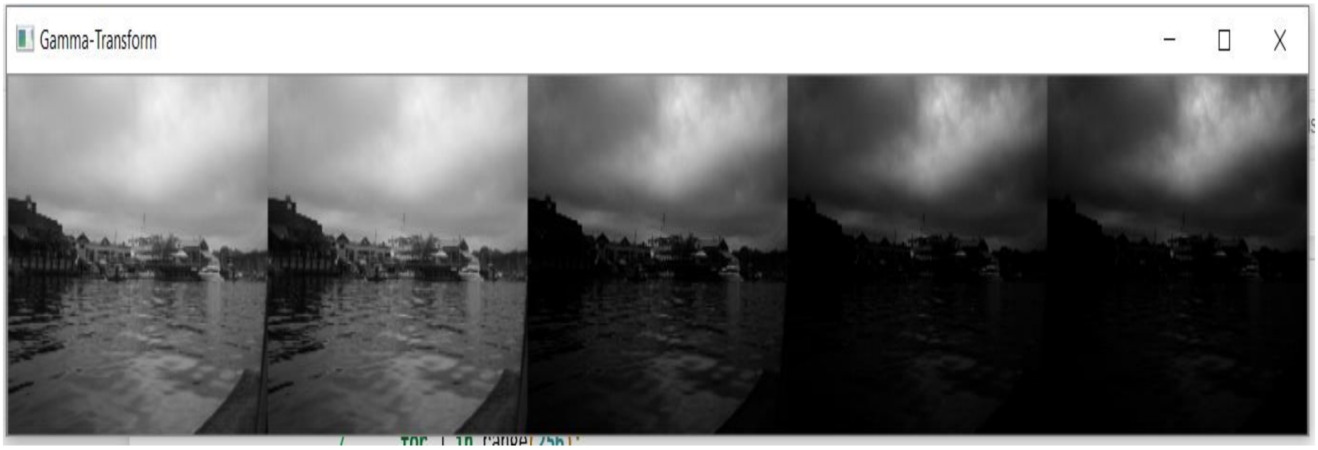
Q3. 3) Given original image lena.jpg identify the operations applied on the images lena1.jpg, lena2.jpg and lena3.jpg

→ Bit plane slicing is applied on lena.jpg. For lena1.jpg it represents the Bit Plane 4, For lena2.jpg it represents the Bit Plane 7 and for lena3.jpg it represents the Bit Plane 1.

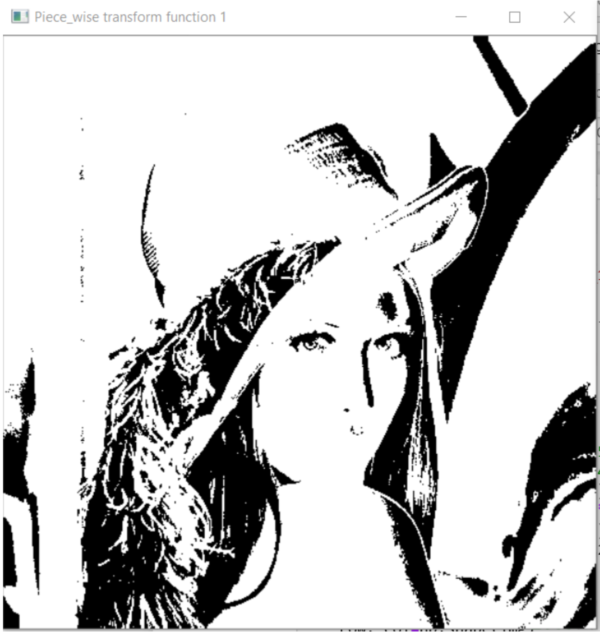
Q4. 1)

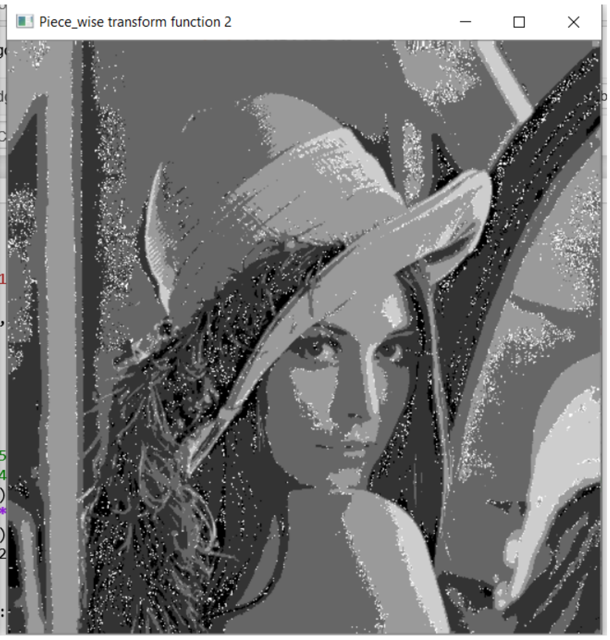


Q4. 2)



Q4. 3)





Q5. 1) What can you say about the histogram of a resulting image if we keep the MSB bits in the bitplane to 0?

→ If we keep MSB as 0, then each pixel values above 128 is subtracted with 128. Eg:- 253 = 11111101, MSB as 0 then 01111101 = 125 (253-128).

The resultant histogram for intensity values in range[128-255] will be now represented in range [0-127]

Q5. 2) What can you say about the histogram of a resulting image if we keep the LSB bits in the bitplane to 0?

→ If we keep LSB as 0, then the current pixel value will represent the value of its previous pixel value. Eg:- 7 is represented as 00000111 but LSB is 0 therefore it is represented as 00000110 (6) pixel value. So the histogram will be spreaded and will have uniform distribution for ODD pixel values.

Q5. 3)

Page No.

Date: / /

Q.5) (3) (i) start bit, stop bit, 8 bit information (data)

We have 512 X 512 cells each containing 8 bit values

$\therefore$ Data = $512 * 512 * 8$ bit

Frame = $\underset{\text{start}}{1} + \underbrace{512 * 512 * 8 \text{ bit}}_{\text{data}} + \underset{\text{stop}}{1}$

$= 512 * 512 * 10$ bit

$= \boxed{2^{18} * 10 \text{ bit}}$

Data rate = 56k bits/sec

Transmission time $t_F = \dfrac{2^{18} * 10 \text{ bit}}{56 * 2^{10} \text{ bit/sec}}$

$= \boxed{45.7 \text{ sec}}$

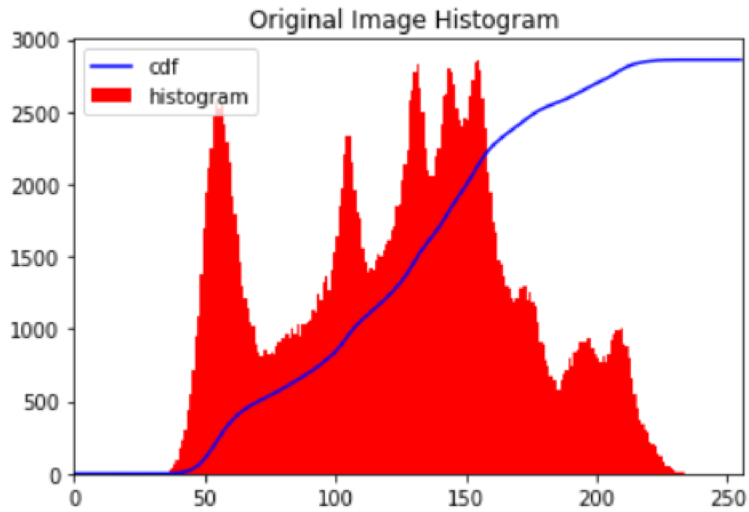
(ii) For 3000 K baud link.

$t_F = \dfrac{2^{18} * 10 \text{ b}}{\cancel{3 * 2^{10}}\ 3000 * 2^{10} \text{ b/s}}$

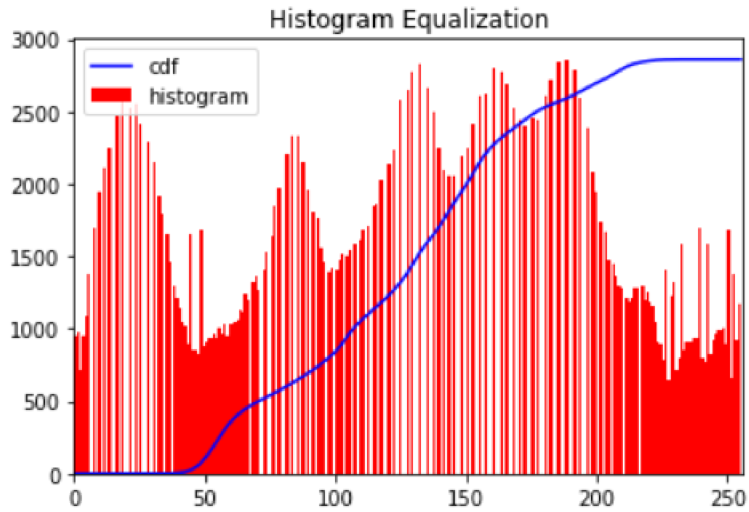
$= \dfrac{2^8}{300} \text{ sec}$

$= \boxed{0.85 \text{ sec}}$

Q6. 1)



Original Image Histogram
cdf
histogram
3000
2500
2000
1500
1000
500
0
0
50
100
150
200
250



Histogram Equalization
cdf
histogram
3000
2500
2000
1500
1000
500
0
0
50
100
150
200
250

Histogram equalized

Q6. 2) Display the input image and the resultant image side-by-side and provide suitable explanation for the changes you observe for multiple input images

→ Histogram equalization assigns the intensity values of pixels in the input image such that the output image contains a uniform distribution of intensities. It improves contrast and the goal of histogram equalization is to obtain a uniform histogram.

If the histogram of any image has many peaks, it will still have peaks after equalization, but peaks are shifted. Because of this, "spreading" is better.

Q6. 3)

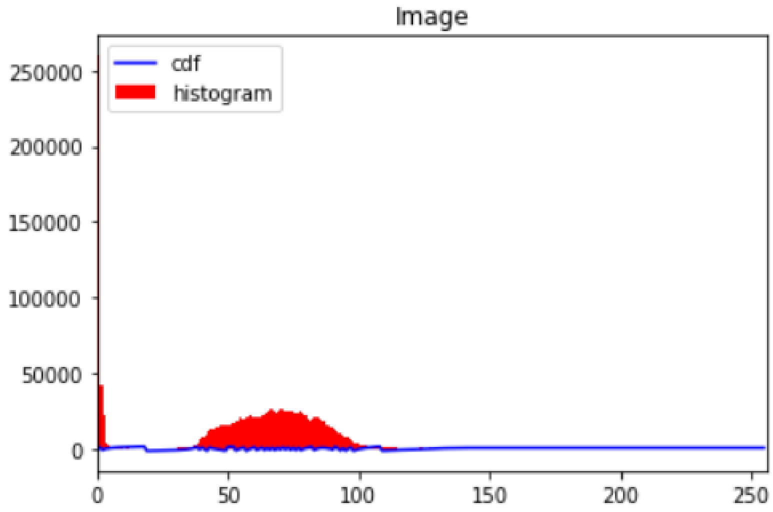
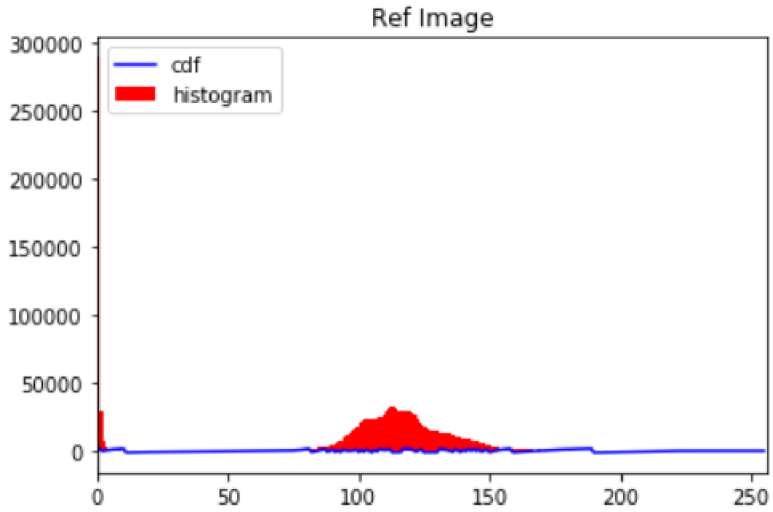
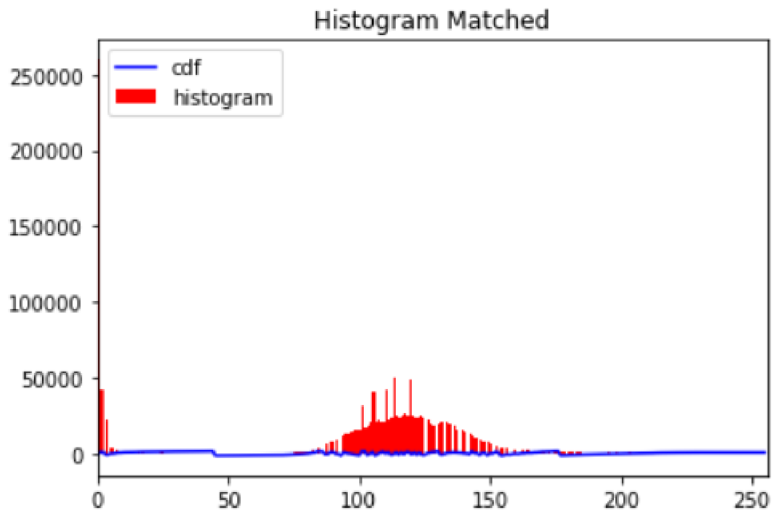


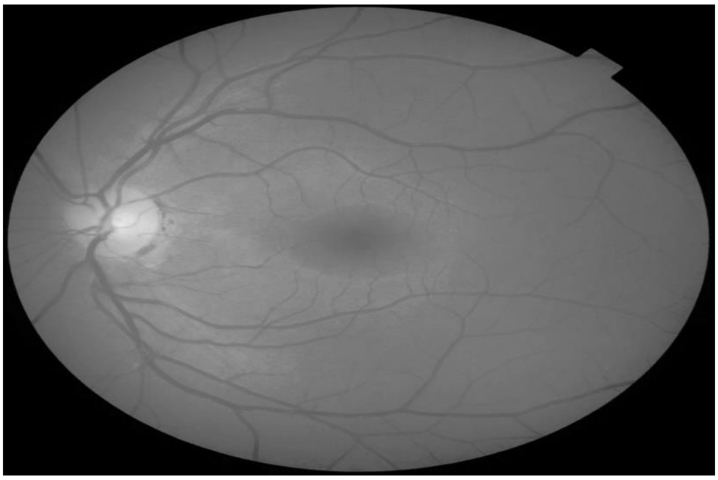
Image
cdf
histogram
250000
200000
150000
100000
50000
0
0
50
100
150
200
250



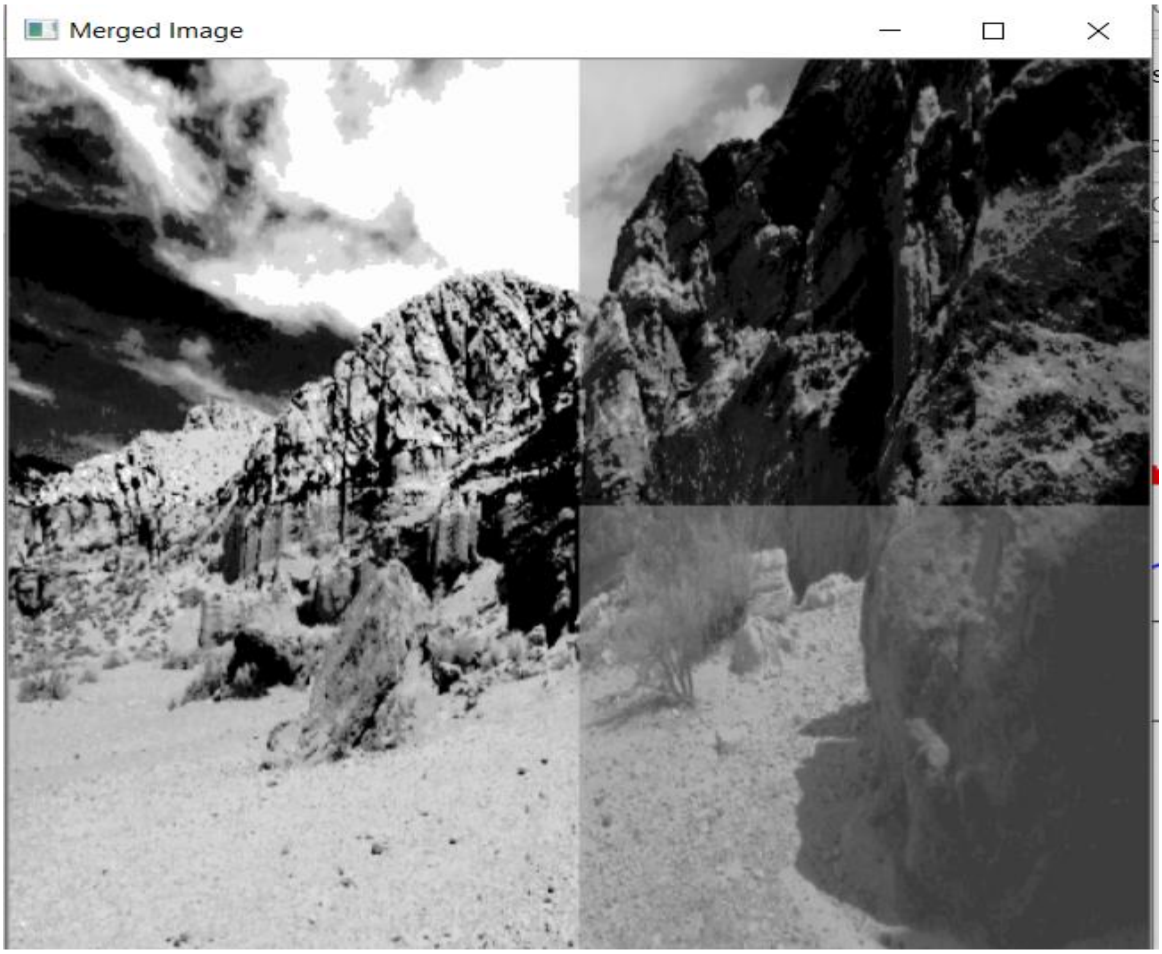
Ref Image
cdf
histogram
300000
250000
200000
150000
100000
50000
0
0
50
100
150
200
250



Histogram Matched
cdf
histogram
250000
200000
150000
100000
50000
0
0
50
100
150
200
250

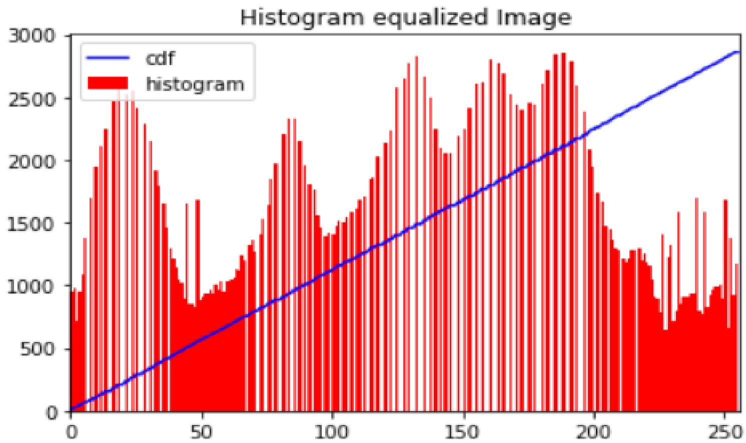


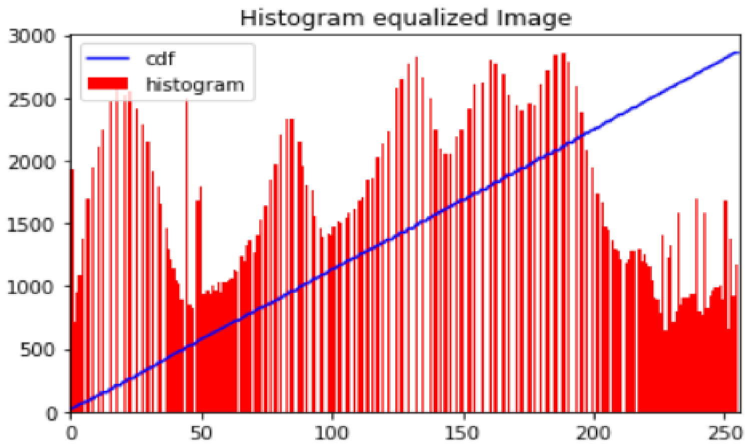
Q6. 4)



Q7. 1) Choose an image of your choice and apply histogram equalization to it. Apply histogram equalization to the resulting image and compare the two images. What are your observations?

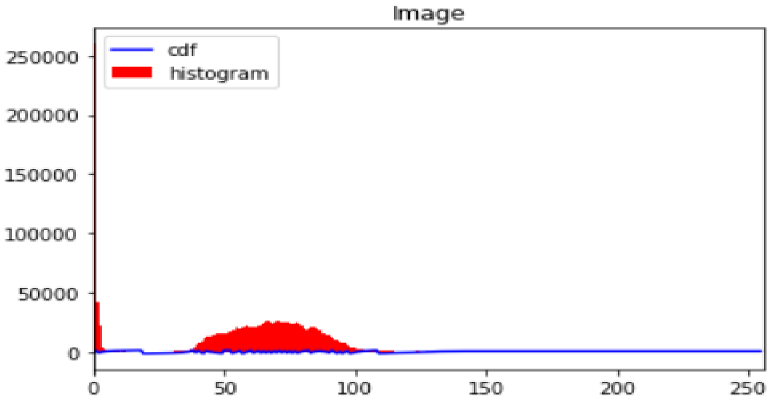
→ For first time histogram equalization the output image contains the uniform distribution of intensities. If Histogram Equalization is applied on the same equalized image then resultant image intensity values will be more uniformly distributed as compared to previous one.

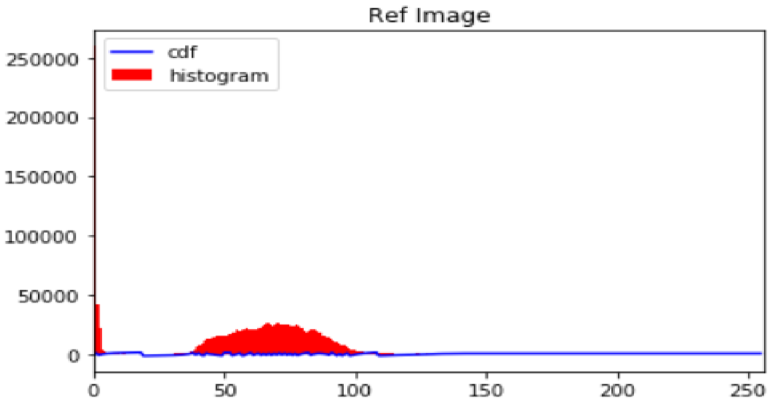


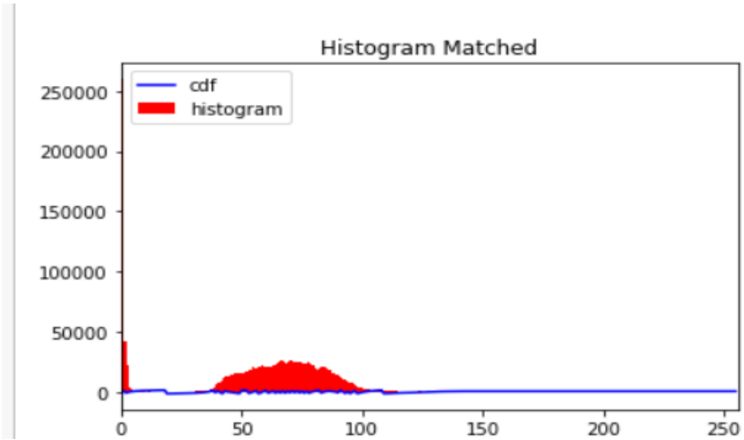


Q7. 2)

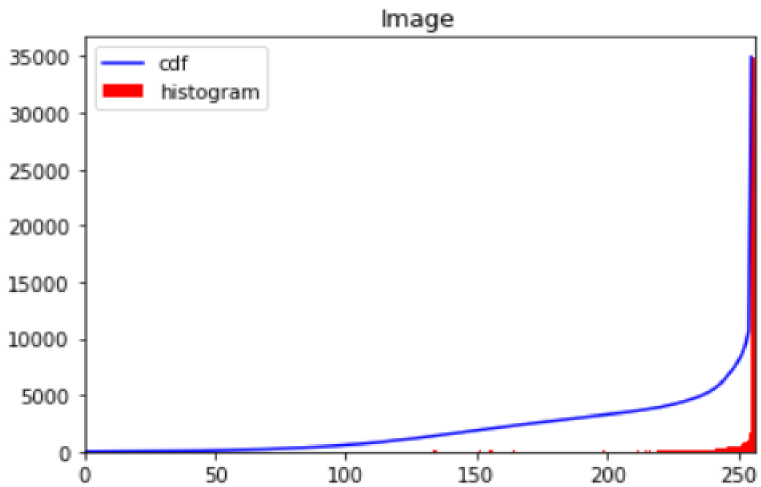
i) Similar Histograms

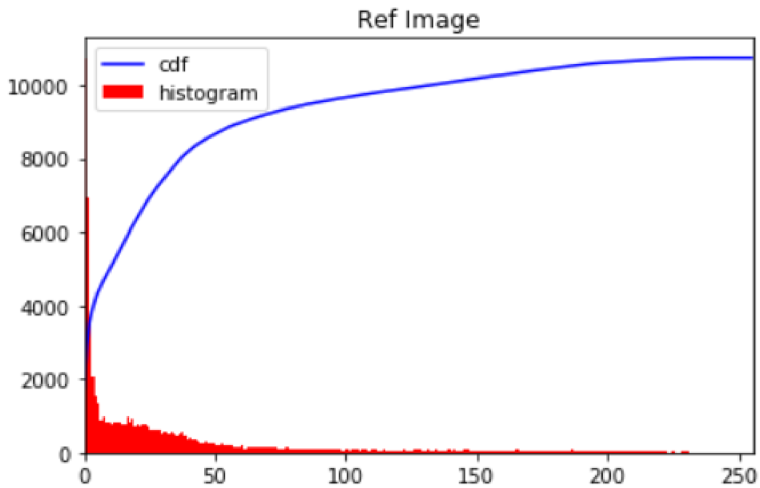


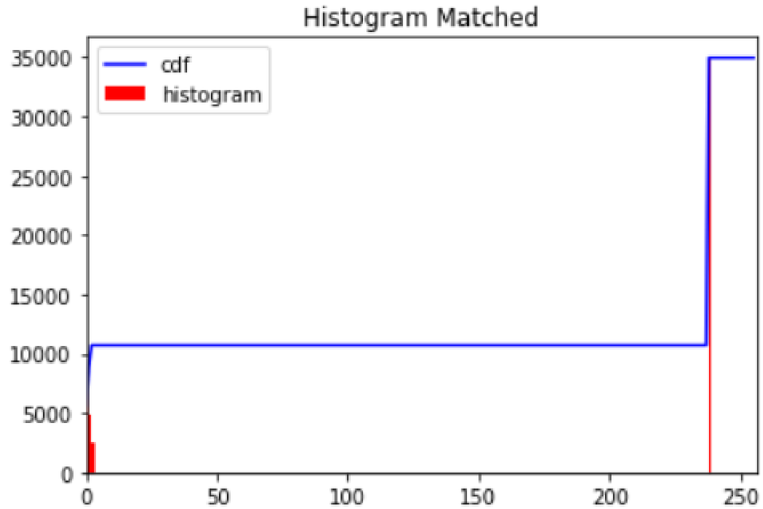


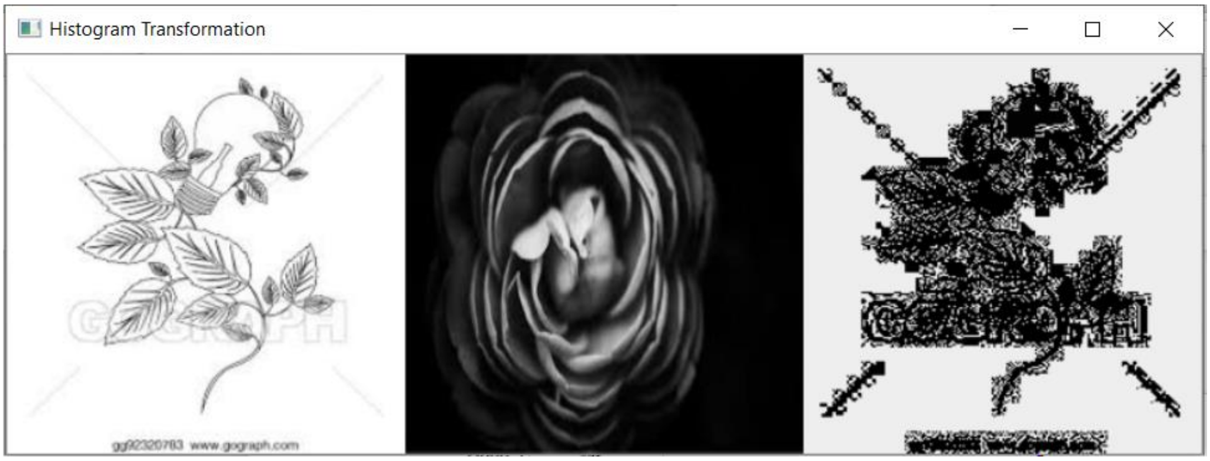


ii) Light -> Dark

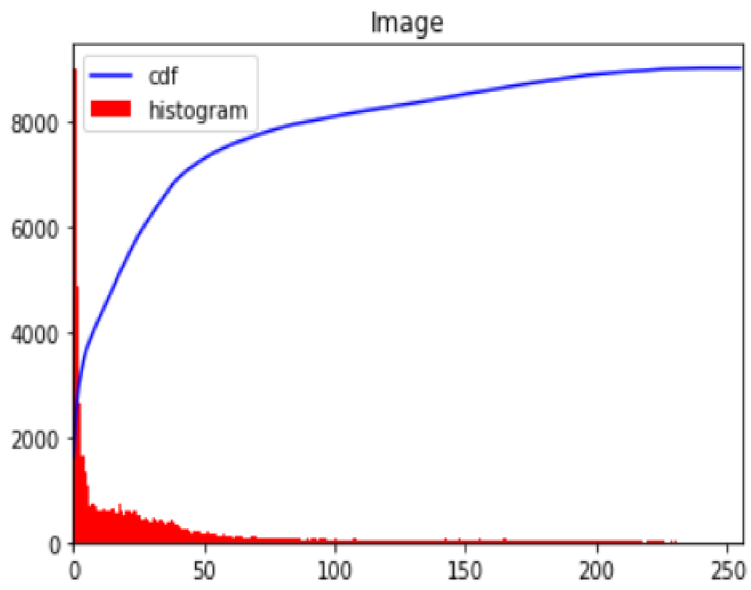


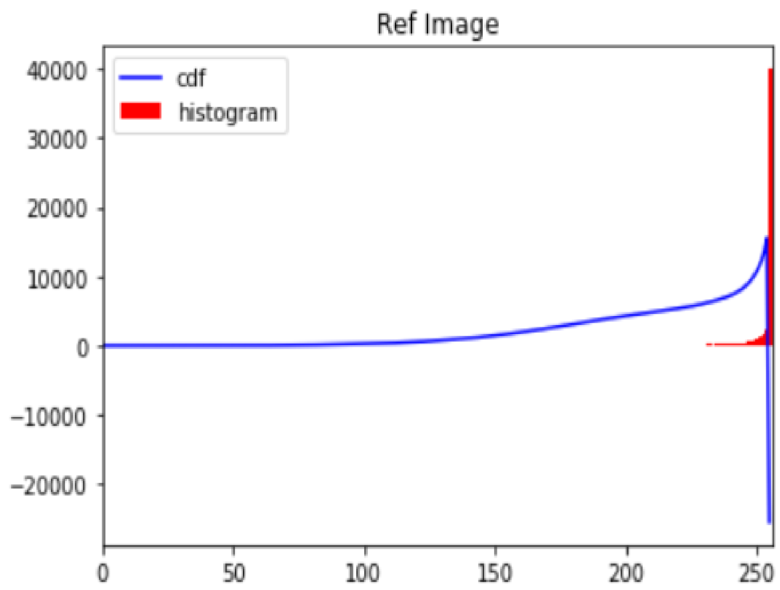


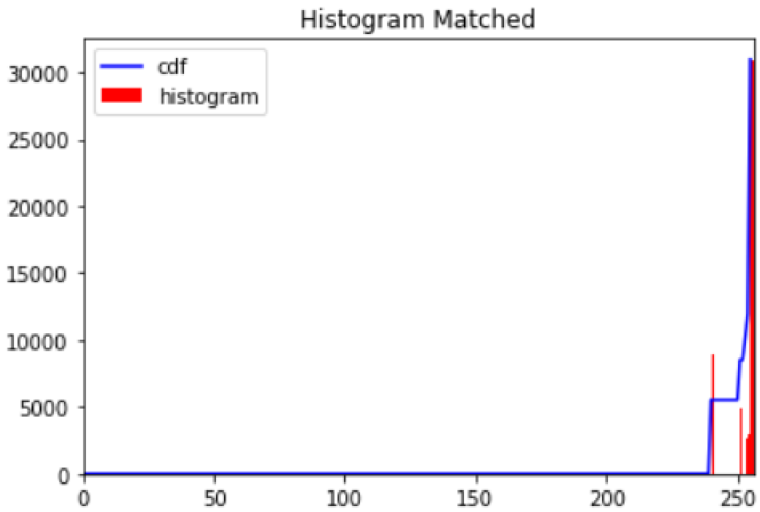

Histogram Matched
cdf
histogram
35000
30000
25000
20000
15000
10000
5000
0
0
50
100
150
200
250


Histogram Transformation

iii) Dark -> Light






Histogram Matched
cdf
histogram
30000
25000
20000
15000
10000
5000
0
0
50
100
150
200
250


Histogram Transformation
gg92320783 www.gograph.com