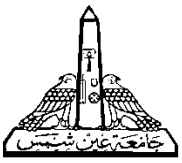

1. Propose a set of gray-level-slicing transformations capable of producing all the individual bit planes of an 8-bit monochrome image.

2. What effect would setting to zero the least significant bit planes have on the histogram of an image in general? Give an example…

3. What effect would setting to zero the most significant bit planes have on the histogram of an image in general? Give an example…

4. Suppose that a digital image is subjected to histogram equalization. Show that a second pass of histogram equalization will produce exactly the same result as the first pass.

5. Two images, f(x,y) and g(x,y), have histograms h_f and h_g. Give the conditions under which you can determine the histograms of
   (a) f(x, y)+g(x, y)
   (b) f(x, y)-g(x, y)
   (c) f(x, y)*g(x, y)
   (d) f(x, y)/g(x, y)

   in terms of h_f and h_g. Explain how to obtain the histogram in each case.

6. Given two digital images I1 and I2 defined as follows:-

I1=										
	1	2	3	4	5	6	7	8	8	8
	9	1	2	3	4	5	6	7	8	8
	8	9	1	2	3	4	5	6	7	8
	7	8	9	1	2	3	4	5	6	7
	6	7	8	9	1	2	3	4	5	6
	5	6	7	8	9	1	2	3	4	5
	4	5	6	7	8	9	1	2	3	4
	3	4	5	6	7	8	9	1	2	3
	3	3	4	5	6	7	8	9	1	2
	3	3	3	4	5	6	7	8	9	1

I2=					
	8	9	10	11	12
	12	8	9	10	11
	13	12	8	9	10
	14	13	12	8	9
	15	14	13	12	8

a) Compute and Plot the histogram/PMF (***$p_r(r)$***) of the gray level values in **I1**.
b) Compute and Plot the CDF (***$P_r(r)$***) of the gray level values in **I1**.
c) Compute and Plot the histogram/PMF ***($p_z(z)$***) of the gray level values in **I2**.
d) Compute and Plot the CDF (***$P_z(z)$***) of the gray level values in **I2**.
e) For histogram matching, we need to determine the relation between **r** and **z**. Obtain and Plot that transformation function for all the range of **r**.
f) Apply that transformation function (you already determined in part (e)) on image **I1.** Plot the new histogram of **I1**after the matching process.

7. In some applications it is useful to model the histogram of input images as Gaussian probability density functions of the form $p_r(r) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(r-\mu)^2}{2\sigma^2}\right)$ where μ and σ are the mean and standard deviation of the Gaussian PDF. The approach is to let μ and σ be measures of average gray level and contrast of a given image.
    a) What is the transformation function you would use for histogram equalization? Plot the r-z map using MATLAB.
    b) Write a MATLAB program to generate that function and obtain results for different images.

8. What is the difference between PDF and PMF? Can a PDF/PMF exceed the value of one? Justify your answer and give examples.

9. Compute and plot the r-z mapping in a continuous domain for the histogram matching case when: $p_r(r) = A\ sin\left(\frac{r\pi}{255}\right),\ r \in [0,255]$ and$p_z(z) = B\ cos\left(\frac{z\pi}{510}\right), z \in [0,255]$. What are the exact values of A and B?