CSE 428/ EEE476: Image Processing
Department of Computer Science and Engineering
Brac University

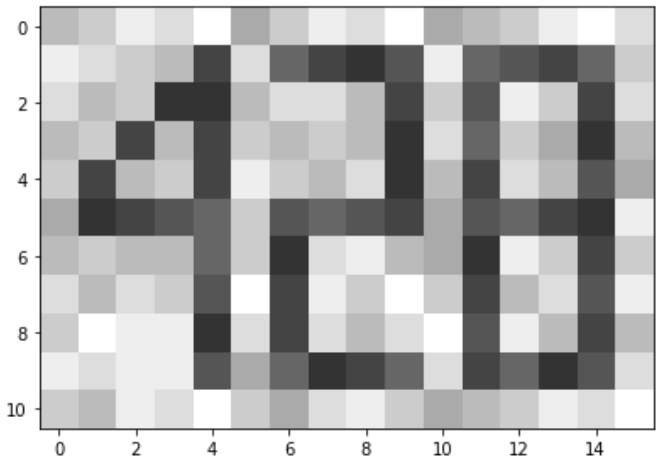
Examination: Midterm | Semester: Fall 2023
Duration: 1 Hour 15 Minutes | Full Marks: 40

Name:	ID:	Section:

ANSWER ALL QUESTIONS

Data Section

Consider the image below for each of the following questions.



The histogram of the image is given in the following table (r denotes intensity level, n_r denotes total number of pixels with intensity r):

r	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
n_r	10	20	11	13	20	13	11	12	15	16	10	26	28	25	21	9

[C01] Question 1.

Consider the above 13×20 image with 4-level quantization ($L_{min} = 0, L_{max} = 15$) given in the data section

a. Plot the histogram and mark the **region of interest** in the histogram **(**i.e. the relevant intensity levels) assuming that you want to clearly identify the "**428". [4 marks]**
b. **Calculate** PDF and CDF for each input pixels r. **[8 marks]**
c. **Apply** Histogram Equalization technique to improve the image clarity. You need to show

the updated values of each pixels. **[6 marks]**

d. State an issue with Histogram Equalization and an advantage of AHE. **[2 marks]**

[CO1] Question 2.

Refer to the same image given in data section and consider (r_1, s_1) and (r_2, s_2) as (4,6) and (11,13) respectively.

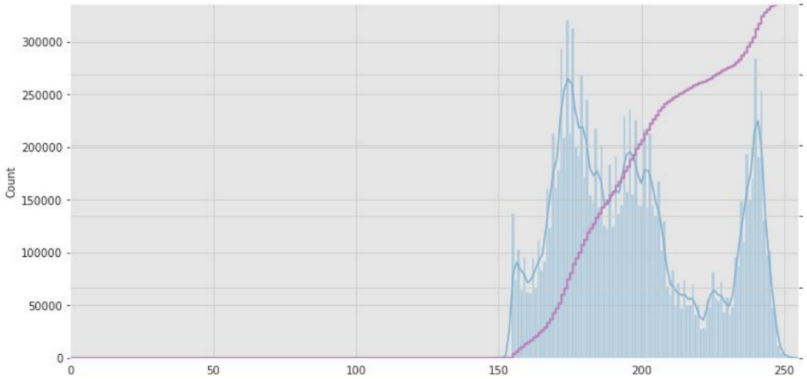
a. **Plot** a graph r_k vs s_k representing contrast stretching clearly indicating (r_1, s_1) and (r_2, s_2) in your piecewise linear mapping. No need to indicate all pixel values in your plot. **[2 marks]**

b. **Determine** the values of the gradients of your plot - α, β and γ **[3 marks]**

c. Now update your pixel values from the table using the gradients you have calculated in b. **[6 marks]**

[C02] Question 3.

Consider the CDF curve below



a. Write three features of the image using the CDF curve. **[3 marks]**

b. If a point transformation is carried out s=r +2, explain what will happen to the contrast of the image ? **[2 marks]**

c. What is quantization? What is mirror padding **[2+2 marks]**