International Islamic University Chittagong

Dept. of Computer Science & Engineering (CSE)

B.Sc. in CSE, Mid-Term Examination, Autumn 2023

Course Code: CSE-4875 **Title:** Pattern Recognition and image processing

Total Marks: 30 Time: 1.5 hours

[Answer all ***three*** questions]

			CO	DL
1(a)	"Nowadays image processing based autonomous vehicle and quadcopter are widely used" – Explain the fields of image processing used in the statement.	2	CO2	C2
1(b)	A grayscale image has pixel intensities ranging from 0 to 255. Design a piecewise-linear transformation function to achieve the following: - Enhance contrast in the middle intensity range (50-150). - Clip low-intensity values (0-49) to black (0). - Clip high-intensity values (151-255) to white (255).	2	CO2	C2
1(c)	"A digital image is a representation of a two-dimensional image as a finite set of digital values" – do you agree with the statement? Explain the answer with mathematical formula.	3	CO2	C2
1 (d)	In some devices CCD based cameras are used where other use CMOS based cameras" Justify the significance of the statement and write the benefit of using both. **Or,** Write the similarity and difference between eyes and camera.	3	CO1	C2
2 (a)	At histogram equalization, why transform function must be behaved strictly monotonically increasing? Explain with proper diagram.	2	CO1	C2
2(b)	A 4 x4 bits/pixel original image is given by (given with 3 bits/pixel) i. Apply histogram equalization to the image by rounding the resulting image pixels to integer. ii. Sketch the histograms of the original image and the histogram-equalized image. iii. "When automatic enhancement is desired, histogram specification is a good approach"- Do you agree? Why?	5	CO3	C3
2(c)	Analyze the effect of adding a constant value to a grayscale image on its overall brightness and contrast. How image addition is used in image averaging ? **Or,** If we convolve and correlation an image with the matrix given below, what would be the relation between the original and modified image?	3	CO2	C2

3	7	8	9
13	11	12	10
12	13	12	9
14	12	11	12

0	0	0
0	0	1
0	0	0

3(a)	"Median filter technique is the best way to de-noise the image" – Justify the statement with your own word with proper example.	3	CO2	C2
3(b)	Write a short note with your own word to explain how do human beings perceive color? Given a color image represented in terms of RGB components, how are the corresponding CMY and HIS coordinates derived?	3	CO1	C2
3(c)	A 4 x4 original image is given with 3 bits/pixel.	4	CO3	C3

2	3	2	0
1	1	5	2
2	7	1	5
2	5	3	1

i) Perform Laplacian operator on the image (Use padding, Use any Kernel)
ii) Analyze the differences of both images.

Or,

A 4 x4 original image is given with 3 bits/pixel.

2	3	1	0
0	5	4	2
2	6	6	3
1	2	3	1

i) Perform Lowpass and High-pass filter on the image separately (Use padding)
ii) Analyze the statement " Lowpass + Highpass = Original image".