ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT) ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

WINTER SEMESTER, 2021-2022

DURATION: 1 HOUR 30 MINUTES

FULL MARKS: 75

CSE 4733: Digital Image Processing

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer all <u>3 (three)</u> questions. Marks of each question and corresponding CO and PO are written in the right margin with brackets.

1.	a)	Suppose you have a gray-scale image of size 50×50 pixels. Your job is now to shrink this image to a size of 32×32 pixels. Apply a resizing operation with less amount of	8 (CO1)
	b)	blocking effects?	(PO1)
	b)	Suppose that a flat area with center at (x_0, y_0) is illuminated by a light source with	(CO2)
		intensity distribution $i(x, y) = Ke^{-[(x-x_0)^2+(y-y_0)^2]}$. Assume for simplicity that the reflectance of the area is constant and equal to 1.0, and let K=255. If the resulting image is digitized with k bits of intensity resolution (in 256 levels; $k=8$), and the eye can detect an abrupt change of eight shades of intensity between adjacent pixels, what value of k will cause visible false contouring?	(PO2)
	(c)	Interpret the statement - "Discrete histogram equalization technique does not, in	10
		general, yield a flat histogram".	(CO1)
			(PO1)
2.	a)	In a given application an averaging mask is applied to input images to reduce noise,	7
		and then a Laplacian mask is applied to enhance small details. Would the result be the	(CO2)
	1.	same if the order of these operations were reversed? Compare and explain your answer.	(PO2)
	b)	Show that applying a $n \times n$ Box filter repeatedly on an image is equivalent to applying a Weighted Average filter of size $m \times m$, where $m > n$. Demonstrate with an example	10
		from 1-D image values.	(CO1) (PO1)
	c)	Design a single mask with which if you perform spatial convolution once, the output	8
		will be equal to sharpening with High-Boost Filter (parameter $k > 1$).	(CO3)
			(PO3)
3.	a)	How can you employ the Histogram Specification technique for color images?	7
		and you can propose a second manages.	(CO1)
	hij t		(PO1)
	b)	Suppose the color values of your image are corrupted by separately adding Gaussian	10
	,.•	noise of zero mean and o variance in each RGB color channels. Now if the same image	(CO2)
		is analyzed using Hue-Saturation Intensity (HSI) components, which channels will show more or less color degradation levels? Compare and explain the cause.	(PO2)
	c)	Consider the following 500×500 image in Figure I, in which the squares are fully	
	-,	saturated red, green, and blue, and each of the colors is at maximum intensity [e.g., (1,	
		0, 0) for the red square]. An HSI image is generated from this image.	
200			

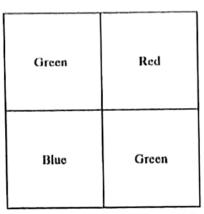


Figure 1: Input for Question 3.(a)

i. The *saturation* channel of the HSI image is smoothed using an averaging mask of size 125×125. Determine the appearance of the result (you may ignore image border effects in the filtering operation).

4+4

ii. Repeat the same process for the hue channel.

(CO2)

(PO2)