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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: VII**

Branch: ES – Cluster Elective **Duration: 3 hrs.**

Course Code: 19ET7CE2IP **Max Marks: 100**

Course: Image Processing **Date: 28.02.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Define the term 'Image'. Analyze the process of sampling and quantization of an image with relevant diagrams. **06**

b) Explain any two image file formats with appropriate file format diagrams. **04**

c) Consider the image segment shown below: **10**

(i) Let **V = {0, 1, 2}** and compute the length of the shortest 4,8 and m - path between **p** and **q**. If a particular path does not exist between these two points, explain why?

(ii) Repeat the above problem considering **V = {1, 2, 3}**

	3	4	2	1 (**q**)
	2	2	1	3
	1	0	0	2
(**p**)	1	2	1	0

UNIT - II

2 a) Given an image of size 3X3 as shown below, determine the output image g(x,y) using logarithmic transformation $\mathbf{g(x,y) = C \log_{10} (1 + f(x,y))}$ by choosing : (i) C = 2 and (ii) C = L / $\log_{10}$ (1+L) **06**

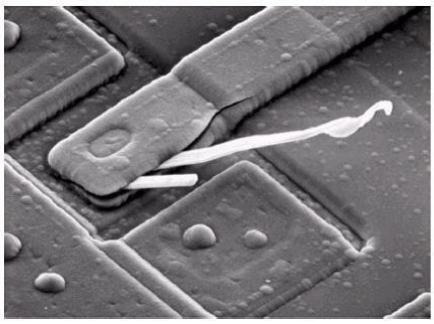
$$f(x,y) = \begin{bmatrix} 132 & 209 & 178 \\ 255 & 29 & 187 \\ 69 & 108 & 222 \end{bmatrix}$$

b) Explain the process of frequency domain filtering with a neat block diagram. **06**

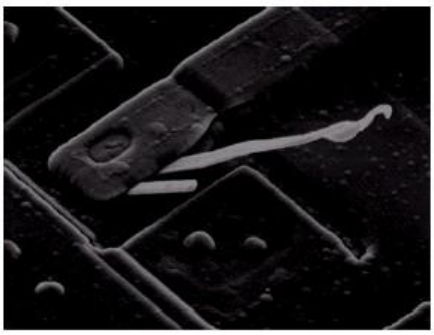
c) With appropriate diagram, derive the expression for a filter developed on the basis of Illuminance-Reflectance model. **08**

OR

3 a) For the input image given below in **Fig. 3.1** apply a suitable Gaussian filter to obtain the output image and comment on the output obtained. Also explain the various properties of Gaussian filter. **06**



Original Image



Output Image

Fig. 3.1

b) Analyze the type of image enhancement to be used with relevant graphs for the following cases: **06**
Gamma correction and contrast manipulation of an image
Highlighting a specific range of gray levels in an image

c) The Histogram of an 8 – level image is as shown below. Analyze and sketch the Histogram of Equalized image and comment on the output image. **08**

8	8	8	8
6	8	9	8
6	9	9	9
6	8	9	8

UNIT - III

4 a) Identify the noise model in ***Fig. 4.1*** and thereby write its PDF, mean and variance parameters. Also describe its salient features. **06**

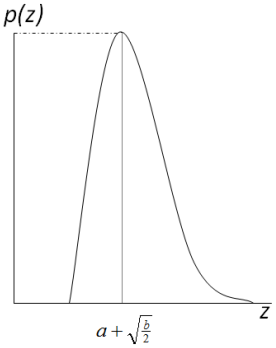


Fig. 4.1

b) Explain with neat block diagram and equations, the image restoration/degradation model. **06**

c) Prove that median filter is an effective tool to overcome Salt and Pepper noise. Consider the example of a 3X5 image for your analysis. **08**

UNIT - IV

5 a) Define the following: **06**

i. Radiance
ii. Luminance
iii. Brightness
iv. Hue
v. Saturation
vi. Tristimulus values

b) Explain the two different methods of color image quantization with relevant equations and examples. **06**

c) A conventional color image using the RGB coordinate requires 8 bits per color component or 24 bits per pixel. One way to reduce the bit requirement is by converting the RGB to HSI representation. **08**

Consider the RGB vectors values as given below:

$$\begin{bmatrix} 100,100,100 & 150,0,0 & 0,150,0 \\ 255,0,0 & 255,255,255 & 0,0,0 \\ 100,150,200 & 0,0,255 & 100,200,150 \end{bmatrix}$$

Using the expression for RGB to HSI conversion and thereby determine what are the corresponding H, S, and I values for the image

OR

6 a) Analyze briefly any two color models used in color image processing with appropriate diagrams. **06**

b) With appropriate steps, describe the intensity slicing method of Pseudo color image processing. **06**

c) Write the steps involved in converting colors from RGB to HSI and vice versa. **08**

UNIT - V

7 a) Analyze the following processes used in morphological processing with relevant equation and examples: **10**

i. Dilation
ii. Erosion

b) Apply split and merge technique to segment the image shown in ***Fig.7.1*** and thereby write its Quadtree representation. **10**

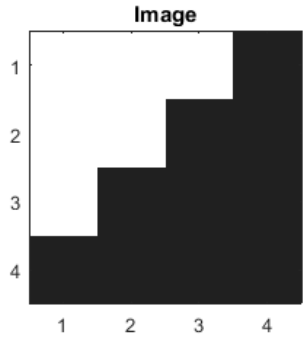


Fig.7.1

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