BE8-R4 : DIGITAL IMAGE PROCESSING

NOTE :

1.	**Answer question 1 and any FOUR from questions 2 to 7.**
2.	**Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours **Total Marks: 100**

1. (a) When you enter a dark theatre on a bright day, it takes an appreciable interval of time before you can see well enough to find an empty seat. Which of the visual processes is at play in this situation ? Explain.

(b) What are the problems in the design and implementation of a Wiener filter ? How does the Wiener filter behave if the image is corrupted by blur only ?

(c) How is Histogram specification superior as compared to Histogram equalization ?

(d) What will be the shape of histogram for below mentioned images ?
(i) Low Contrast Image
(ii) High Contrast image

(e) Images are degraded by random noise. Describe 'Salt & Pepper' Noise.

(f) There are a family of imaging distortions that degrades the quality of satellite images. Describe geometric distortions.

(g) Write a short note on: Image Mosaicing **(7×4)**

2. (a) Suppose m be graylevel of input image which is to be transformed to L by linear stretching, where L is the graylevel of the output image. Let ni and ni' are the number of pixels having i-th graylevel in input and output images, respectively. Suppose for an 8-level image we have the following frequency table for input graylevels. 'a' and 'e' both are > 0.

i	0	1	2	3	4	5	6	7
Ni	0	0	a	b	c	d	e	0

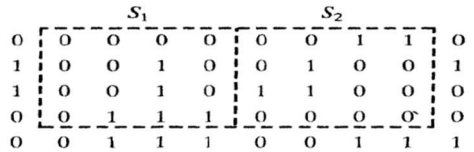
Find frequency table for the output graylevels.

(b) Write a short note on applications of image processing.

(c) Image Enhancement is very important phase of Image processing. Explain 'Histogram Specification'. **(8+6+4)**

3. (a) Consider a well known sharpening spatial filter, the Laplacian filter. Find out the corresponding frequency domain filter and analyze it's nature.

(b)



Consider two image subsets S1 and S2. For V= {1} determine whether two subsets are (a) 4-adjacent, (b) 8-adjacent or (c) m-adjacent.

(c) Describe Image Restoration process with suitable block diagram. **(8+6+4)**

4. (a) Consider the following figure where each small rectangle represents a pixel and the value inside it is gray level at that pixel. Hence, whole array represents a digital image G of size 5×5. The centre pixel at position G(2,2) is marked by underline.

0	2	1	1	2
1	0	1	0	5
0	1	<u>7</u>	6	6
6	6	5	6	7
7	5	6	5	6

Perform image smoothing in spatial domain with a 3×3 neighbourhood.

(i) Mean filter (ii) Median filter

(iii) Min Filter (iv) Max Filter

(b) Explain Power-low Transform and Gamma Correction.

(c) Explain Rayleigh Noise and Exponential Noise using suitable equations. **(6+6+6)**

5. (a) Consider frequency count of various intensities. Find Huffman Code.

i	0	1	2	3	4	5	6	7
Count	0.05	0.008	0.022	0.06	0.18	0.13	0.07	0.48

(b) Write short-note on Block Coding.

(c) Describe Run-Length Coding. Is the Run-Length code suitable for natural images ? Is the Run-Length code suitable for graphical images and why ? **(6+6+6)**

6. (a) Explain High pass Filters for Sharpening in Frequency Domain.

(b) Noise removal is possible through spatial filtering. Describe Arithmetic Mean Filter, Geometric Mean Filter and Harmonic Mean Filter.

(c) Give equations for RGB to HSV Transformation. **(8+6+4)**

7. (a) Explain Structure of Human Eye.

(b) Describe following terms:

(i) Stereopsis (ii) Stereo disparity

(iii) Stereo Vision (iv) Correspondence computation

(v) Occlusion (vi) Photometric Stereo **(8+10)**

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