CE5-R3: IMAGE PROCESSING AND COMPUTER VISION

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) Write various steps involved to convert a RGB color model into a HIS color model.
b) What do you mean by histogram of an image? Explain briefly the terms Histogram and Equalization.
c) State the differences between lossy and lossless image compression techniques.
d) Explain briefly the operation 'Dilation' in morphological image processing.
e) Discuss with suitable examples at least two edge detection operators.
f) Write the steps involved in filtering in the frequency domain.
g) Describe how depth is estimated in stereo vision.

(7x4)

2.

a) Explain briefly the image formation process and explain briefly geometric model to describe this process.
b) What do you mean by sharpening of an image?
Consider the following figure where each small rectangle represents a pixel and the value inside it is graylevel at that pixel. Whole array represents a digital image g(r,c) of size 5 X 5. The center pixel g(2,2) is marked by underline. Sharpen the pixel using special domain technique, Laplacian operator $\nabla^2 \mathbf{g}$ using either 4-connectivity or 8-connectivity approach.

0	1	0	6	7
2	0	1	6	5
1	1	7	5	6
1	0	6	6	5
2	5	6	7	6

c) Define the terms: Image Sampling and Image Quantization.

(6+6+6)

3.

a) Write about an image segmentation technique; region growing as region based approach.
b) Suppose M to be the gray level of input image, which has to be transformed to L by linear stretching. Then L is the gray level of the output image. Let N_i and N'_l are the number of pixel having i-th gray level in the input and the output images respectively. Suppose for an 8-level image we have following frequency table for the input gray levels.

Using linear stretching find the frequency table for the output gray levels.

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

c) Explain briefly the steps involved in Quad tree decomposition of an image. Discuss the advantages of Quad tree representation of an image.

(6+6+6)

4.

a) Draw a diagram of general compression system model and briefly explain the functionality of each component.

b) Explain the JPEG compression technique. What level of compression can be achieved using JPEG?

c) Describe briefly occlusion. What are the various techniques to find out occlusion? Explain any one technique in brief.

(6+6+6)

5.

a) What do you mean by edge detection? Explain with example the Roberts and Sobel operators.

b) Write the steps involved in edge-linking problem using an approach based on Hough transform.

c) Write a procedure to stretch contrast an image.

(6+6+6)

6.

a) What is connected component in an image? Describe any one approach for finding connected components in an image.

b) Discuss the significance of 'Projective geometry" in computer vision.

c) Explain high pass filters for sharpening in frequency domain.

(6+6+6)

7.

a) Discuss the applications of epipolar geometry in vision.

b) Write about 3-dimensional transformation. Explain one of them in detail.

c) List out the applications of computer vision systems in the society. Illustrate any two applications in detail.

(6+6+6)