CE5-R3: IMAGE PROCESSING AND COMPUTER VISION

NOTE:

> 1. **Answer question 1 and any FOUR questions from 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 steps to convert YIQ color model into RGB color model.
b) What do you mean by histogram of an image? What are its utilities in image processing?
c) What do you mean by image compression? Write about types of image compression techniques and specify at least two techniques in each type.
d) Explain the meaning of morphological image processing and list out at least four morphological algorithms.
e) Discuss the difficulties in 3D vision using intensity images as input.
f) Why is Laplacion of Gaussian (LoG) useful in image filtering?
g) "Quad tree representation of image with large homogeneous regions is less expensive". Why?

(7x4)

2.
a) What do you mean by color models? List out the hardware oriented color models with their utilities.
b) Describe the image formation process and explain briefly geometric model to describe this process.
c) Discuss Sampling and Quantization processes with regard to 3D images.

(4+8+6)

3.
a) Explain the procedure of histogram matching. Also discuss, how it differs from histogram equalization.
b) Suppose M 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'_i 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	100	200	300	400	500	0

c) Define the term: Image enhancement and differentiate image enhancement with respect to spatial domain and frequency domain.

(6+6+6)

4.
a) Draw a diagram of general compression system model and briefly explain the functionality of each component.
b) List out the areas where error-free compression techniques are used. Discuss in general operations involved in this technique.
c) Outline the statistical approach of the use of moments for texture description.

(6+6+6)

5.
a) Explain the morphological operations: dilation, erosion and thinning.
b) Discuss at least two applications of gray scale morphology.
c) Write steps involved in edge-linking problem using an approach based on Hough transform.

(6+6+6)

6.
a) Write about multi modal image processing with its applications.
b) Consider a linear position invariant image degradation system with impulse response $h(x-\alpha, y-\beta)=e_{-[(x-\alpha)^2 + (y-\beta)^2]}$. Suppose that the input to the system is an image consisting of a line of infinitesimal width located at x=a and modeled by $f(x,y)=\delta(x-a)$. Assuming no noise, what is output image g(xy)?

(9+9)

7.
a) Discuss the different 3-dimensional object representation schemes with examples.
b) Discuss how clustering can be used for image segmentation.
c) Describe how depth is estimated using stereovision?

(8+6+4)