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) Explain spatial and Gray Level resolution

b) Describe Canny edge dectector and how it is used.

c) Define 2D-DFT and how that it can be computed using computation which of 1D-DFT.

d) How can we use Hough transform for detecting circles in an image?

e) Describe how depth is estimated using stereovision.

f) What is pyramidal processing?

g) Explain the principle of K-NN based pattern classification.

(7x4)

2.

a) When a family of N-dimensional vectors form a complete orthnormal set? For 2D image transforms,what is separablity property of 2D orthonormal basis functions? How does it help in computing the transform?

b) Describe the following operations:

i) Median Filtering;

ii) Lowpass Spatial Filtering.

(10+[4+4])

3.

a) Describe the process of Histogram equalization. What purpose does it serve?

b) Explain correspondence between spatial and frequency domain filters by taking the example of Low Pass Filter.

(8+10)

4.

a) Consider a linear filter whose impulse response is the second derivative of the Gaussian Kernel $\exp(-x^2/2\sigma^2)$.Show that regardless of the value of σ ,the response of this filter to an edge modeled by step function is a signal whose zero-crossing is at the location of the edge.

b) Discuss how clustering can be used for image segmentation.

(10+8)

5.

a) Explain the HSV color model compare with RGB and CMY color model and also discuss the advantage and disadvantage.

b) Consider the problem of image blurring caused by uniform acceleration in the X direction .If the image at rest at time t=0 and accelerates with uniform acceleration $x_0(t)=at/T$ for a Time T, find the transfer function H(u,v).

(6+12)

6.

a) What do you understand by Camera Calibration?

b) Explain JPEG Coding technique. What level of compression it can offer?

c) Outline the statistical approach of the use of moments for texture description.

(6+6+6)

7. Write short notes on:

a) Segmentation of range images.

b) How shape can be obtained from shading.

c) Co-occurrence in describing textures.

(6+6+6)