

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 the simple image model. How the basic nature of image is characterized by the two components, called illumination and reflectance components.
- b) What is the fundamental difference between spatial and frequency domain techniques used for enhancing an image? Explain gray-level transformation functions for contrast enhancement.
- c) Explain how 2D Fourier transform and its inverse are used to enhance an image in frequency domain.
- d) What do you understand by convolution? Explain briefly the properties of convolution.
- e) What do understand by boundary extraction? Also briefly explain the extraction of connected components in an image.
- f) Describe steps involved in JPEG compression.
- g) What do you understand by geometric transformation with respect to image pre-processing? Explain with examples.

(7x4)

2.

- a) Explain briefly following hardware oriented models.
 - i) RGB
 - ii) CMY
 - iii) YIQ
- b) Explain homomorphic filtering.

(10+8)

3.

- a) What do you understand by Histogram equalization? Also explain the Histograms corresponding to four basic image types. (Dark, Bright, Low-Contrast and High-Contrast)
- b) What do you understand by region merging segmentation scheme? Explain region merging algorithm steps in brief.
- c) For what purpose Hit-or-Miss transformation is used in morphological image processing? Briefly explain Hit-or-Miss transformation.

(6+6+6)

4.

- a) Why high pass filtering is used to enhance an image? Explain ideal filter and butterworth filter.
- b) Explain the important morphological operations: Dilation, Erosion, Opening and Closing in detail. How can these be used in obtaining skeleton of an image?

(8+10)

5.

- a) What is the difference between spatial filtering and spatial filters? For what purpose smoothing filters are used in image enhancement phase? Explain Lowpass spatial filtering.
- b) Why is Laplacian of Gaussian (LoG) useful in image filtering?

- c) Explain the basic principle of stereo vision. Also explain the geometry of the system with two cameras (epipolar geometry in stereopsis).

(4+8+6)

6.

- a) What is the basic concept in Hough transform?
- b) How is Hough transform used in line detection?
- c) What is the use of parametric space in detection of circles using Hough transform?

(6+8+4)

7.

Write short notes on:

- a) Run length coding for image compression
- b) Edge Detection
- c) Difficulties in 3D vision using intensity images as input

(6+6+6)