2022

COMPUTER SCIENCE — HONOURS

Paper : DSE-A-1

(Digital Image Processing)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.*** **1** and ***any four*** from the rest.

1. Answer ***any five*** questions : 2×5

(a) What is image restoration?

(b) Find the city-block distance between two pixels P(134, 145) and Q(20, 112).

(c) Define m-adjacency between two pixels in a binary image.

(d) What is quantization?

(e) What is the use of a high-pass filter?

(f) Differentiate between colour image and greyscale image.

(g) What is the purpose of feature extraction step in digital image processing?

(h) What do you mean by image segmentation?

2. (a) How can image sharpening be achieved using unsharp masking operation?

(b) What do you mean by gamma correction? How can it be achieved?

(c) Define contrast stretching of an image. Draw an intensity transformation function that can achieve contrast stretching. 3+(1+2)+(1+3)

3. (a) Explain min filter, max filter and midpoint filter.

(b) Write a short note on histogram equalization and histogram stretching. (2×3)+4

4. (a) Discuss bit plane slicing and log transform for image enhancement.

   (b) For the following image, find :

   (i) Digital negative of the image

   (ii) Contrast stretching $r_2 = 5$, $r_1 = 3$, $s_2 = 6$, $s_1 = 2$

$$F(x, y) = \begin{bmatrix} 4 & 3 & 2 & 1 \\ 3 & 1 & 2 & 4 \\ 5 & 1 & 6 & 2 \\ 2 & 3 & 5 & 6 \end{bmatrix}$$

4+(2+4)

5. (a) Explain region growing and region splitting.

   (b) Explain Sobel and Prewitt operators with required derivative masks. 5+5

6. (a) How is magnitude of the gradient of an image used for edge detection? Explain in detail.

   (b) Write down the filter masks which are used for horizontal, vertical and diagonal line detection. 5+5

7. (a) Differentiate between global thresholding and local thresholding.

   (b) What do you mean by multiple thresholding operation? When is it necessary?

   (c) Write down the steps for the basic global thresholding operation. 2+(2+1)+5

8. (a) What is histogram of digital image? What information one can get by observing the histogram of image?

   (b) Perform the histogram stretching on an image given below with 8 intensity levels :

Grey level	0	1	2	3	4	5	6	7
Intensity level	0	0	50	60	50	20	10	0

(2+3)+5