

B.E. (IT) Semester - VIII Examination, June 2013.

(Revised Course)

IMAGE PROCESSING AND PATTERN RECOGNITION

Duration : 3 Hours

Total Marks : 100

Instruction : Answer any 5 questions with atleast one from each Module.

MODULE - I

1. a) Explain sampling and quantization process applied on an image. 6
- b) With the help of transformation graphs explain the following gray level transformations : 8
- ✓ 1) Negative of an image
 - ✓ 2) Contrast stretching
 - ✓ 3) Gray level slicing
 - ✓ 4) Logarithmic transformation. 6
- ✓ c) Given the following, perform histogram equalization ?
- | | | | | | |
|------------|---|---|----|---|---|
| Gray level | : | 0 | 1 | 2 | 4 |
| Frequency | : | 4 | 20 | 4 | 8 |
2. a) What is the difference between spatial and frequency domain ? How image sharpening can be carried out in spatial domain ? 10
- b) Explain the following image smoothing process, with an example : 10
- 1) Median filtering
 - 2) Low pass filtering.

MODULE - II

3. ✓ a) Define Fourier transform for a digital image. State translation and distributivity property of 2-D Fourier transform. 8
- ✓ b) Explain Ideal and Butterworth high pass filters. 6
- ✓ c) Describe the model of image degradation and restoration, with diagram. 6
4. ✓ a) How filtering is carried out in frequency domain ? 7
- ✓ b) Explain inverse filtering process for image restoration. 7
- ✓ c) Describe the following noise models : 6
- ✓ 1) Impulse noise
 - ✓ 2) Uniform noise.

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MODULE - III

5. a) Describe the color slicing technique. 5
 b) What is morphology? List its various applications. Explain region filling algorithm with an example. 8
 c) Explain Hough transform for line detection. 7

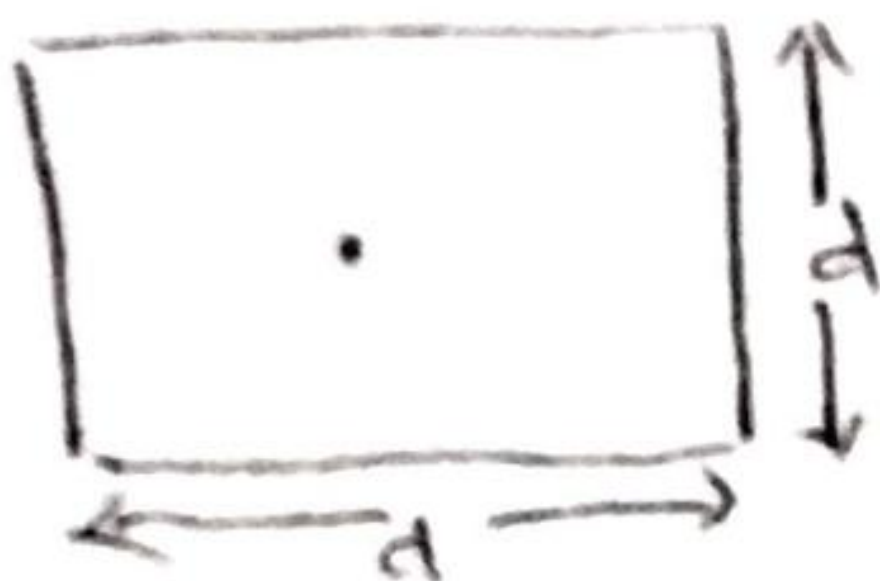
6. a) What is thresholding? Consider the following image.

$$\begin{bmatrix} 1 & 1 & 2 & 2 & 1 & 1 \\ 2 & 3 & 4 & 4 & 3 & 2 \\ 2 & 3 & 4 & 4 & 3 & 2 \\ 1 & 1 & 2 & 2 & 1 & 1 \end{bmatrix}$$

Obtain the threshold value and perform thresholding operation. 8

- b) Write the basic formulation of region based segmentation. Describe region growing approach. 8

- c) Perform opening morphological operation for a given image. 4



Set (A)



Structuring element (B)

MODULE - IV

7. a) Explain the following boundary descriptors: 6

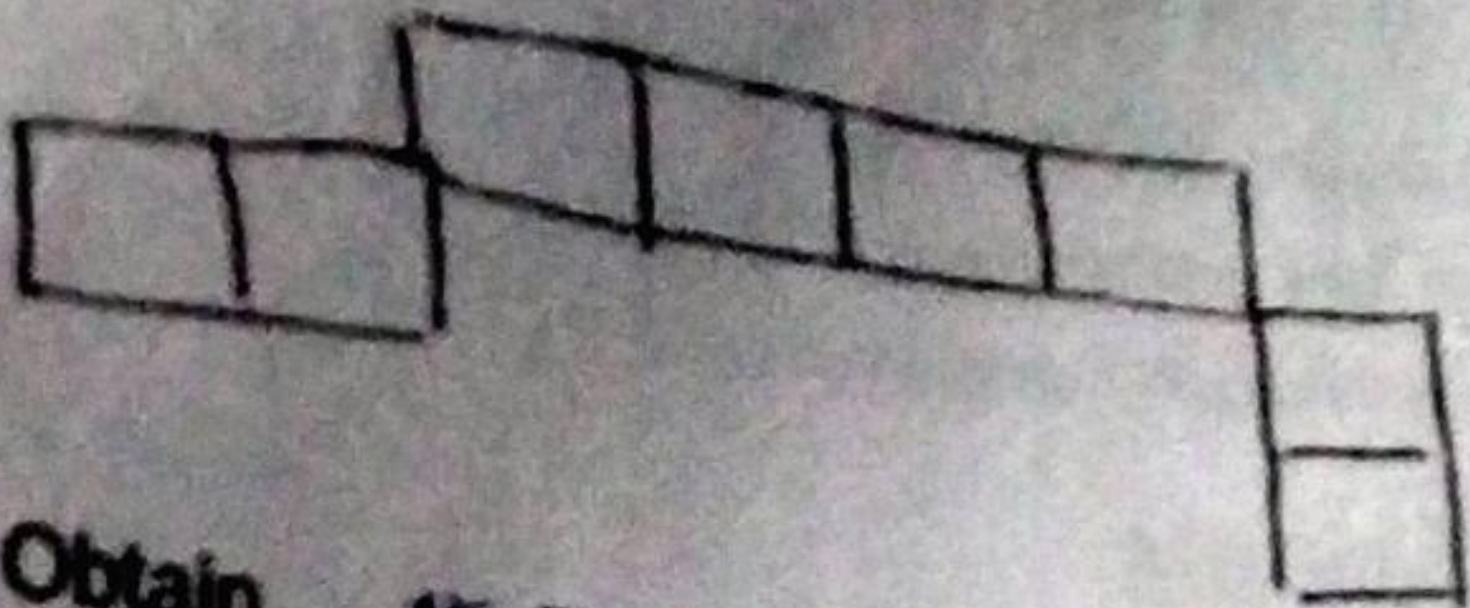
- 1) Curvature
- 2) Shape number
- 3) Statistical moments.

- b) Describe any 3 region representation approaches. 6

- c) Define pattern and pattern class. Explain pattern recognition using minimum distance classifier. 8

a) Given the following boundary:

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- Obtain
- ✓ 1) Boundary length
 - ✓ 2) Chain code
 - ✓ 3) 1st difference
 - ✓ 4) Curvature.

8

b) Write a note on regional descriptors.

6

c) How finite automation can be used OS string recognizer?

6

B.E. (IT) (Sem. - VIII) Examination, May/June 2012
IMAGE PROCESSING AND PATTERN RECOGNITION

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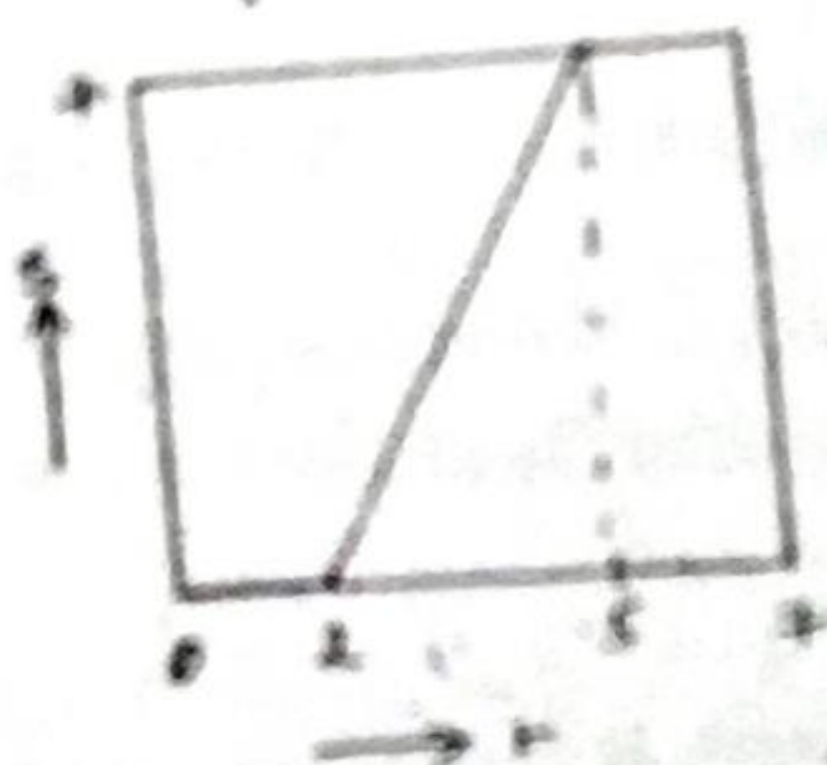
Total Marks : 100

Instructions : 1) Answer any five questions with atleast one question from each module.
 2) Draw neat labelled diagrams wherever necessary.

MODULE - I

1. a) Explain the structure of the human eye and how an image is formed in the eye. 8
 - b) Explain the following with reference to an image : 3
 - i) Spatial and gray level resolution 3
 - ii) Checker board and false contouring effects.
 - c) Perform contrast stretching on the image segment shown below according to the transfer function shown in the figure. 6
- Draw the histogram of the original image and the contrast stretched image

3	3	4	5	6
4	5	2	4	2
3	4	3	1	0
6	7	6	7	0



2. a) Differentiate between point processing and mask processing techniques. Give two examples of each. 4

P.T.O.

b) An image matrix [A] is given below :

$$[A] = \begin{bmatrix} 3 & 3 & 3 & 3 \\ 3 & 5 & 5 & 3 \\ 3 & 5 & 5 & 3 \\ 3 & 3 & 3 & 3 \end{bmatrix}$$

Write matrices for the processed image when the following enhancement techniques are applied to image [A]:

(Clearly state any assumptions made)

- | | |
|---|---|
| i) Average filtering | 3 |
| ii) Median filtering | 2 |
| iii) Negative of an image | 2 |
| iv) Thresholding of image with threshold value equal to 4 | 2 |
| v) Zooming the image by a factor of 2. | 3 |
| c) What do you understand by gradient in an image ? How is gradient defined ? | 4 |

MODULE – II

- | | |
|---|---|
| 3. a) Define the Fourier and inverse Fourier transform of an image. Explain the importance of the Fourier transform in image processing. State any two applications of the Fourier transform. | 8 |
| b) State the convolution theorem for 2-dimensional discrete functions. How is this used in image processing ? | 5 |
| c) Explain the Wiener filtering technique for image restoration. | 7 |
| 4. a) Explain the ideal high pass and low pass filters in the frequency domain. What are the advantages and disadvantages of carrying out filtering in the frequency domain ? | 7 |
| b) Explain any three noise models commonly used in image processing. | 7 |
| c) Explain the problem of restoration of an image. How is image restoration different from image enhancement ? | 6 |

MODULE - III

5. a) What do you understand by the term 'color model'? What is its purpose? Explain the HSI color model. 7
- b) What is the skeleton of an image? Explain the method to find skeleton of an image. 6
- c) Explain the detection of straight lines using the Hough Transform with suitable examples. 7
6. a) How can thresholding be used for image segmentation? Explain the terms global, local and adaptive thresholding. 7
- b) Explain color slicing and its use. 5
- c) Define and perform opening, closing and boundary extraction operations on the image labeled as figure 1 using the structuring element labeled as figure 2. 5

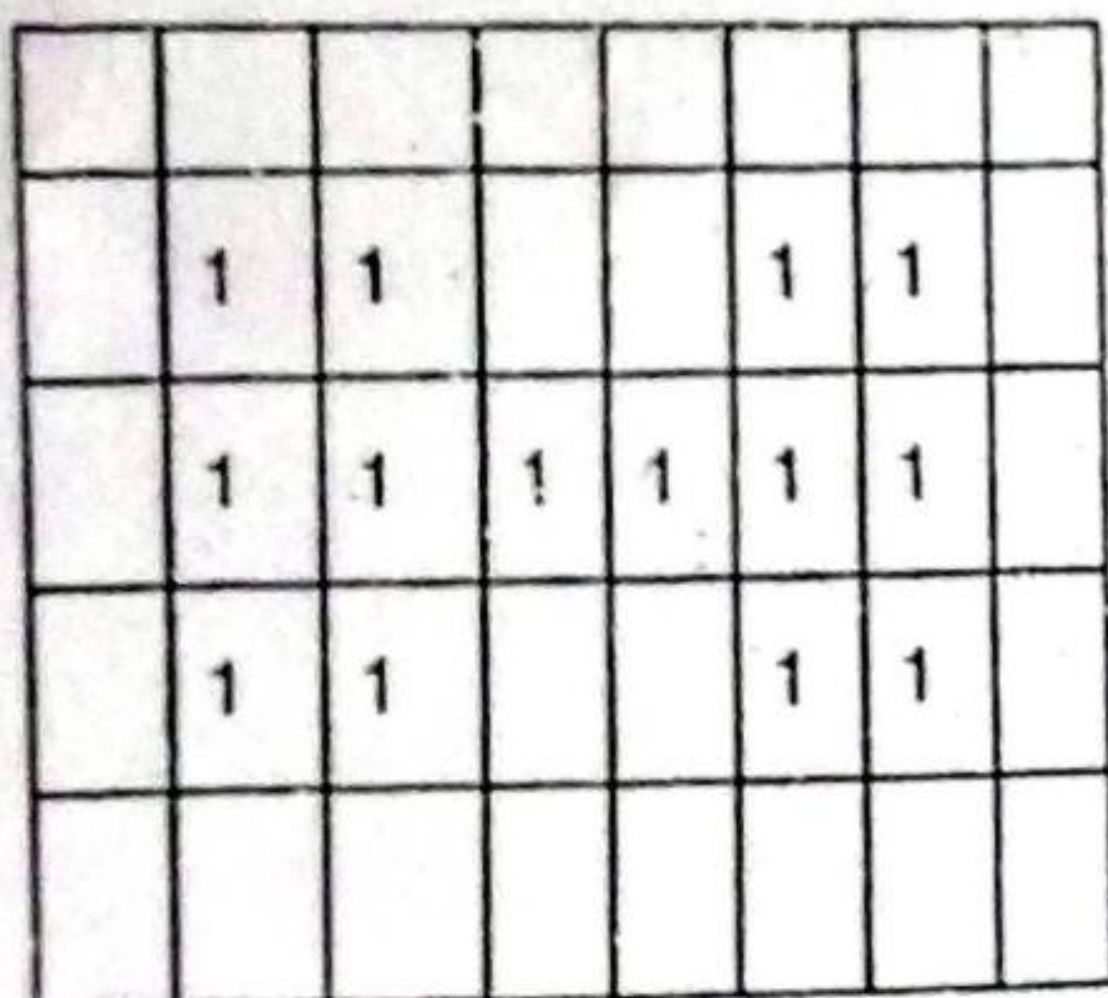


Figure 1

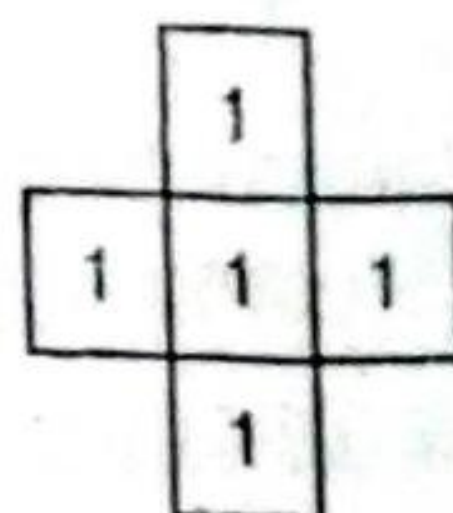


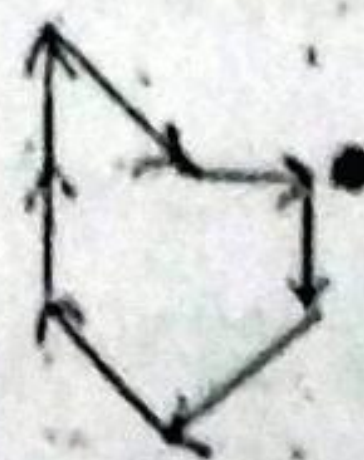
Figure 2

MODULE - IV

7. a) For the seven-segment boundary given below, write down the : 6
- i) 8- direction chain code starting at the location of the large dot.

ii) First differences of the chain code

iii) Shape number



b) Explain the following border representation descriptors with examples.

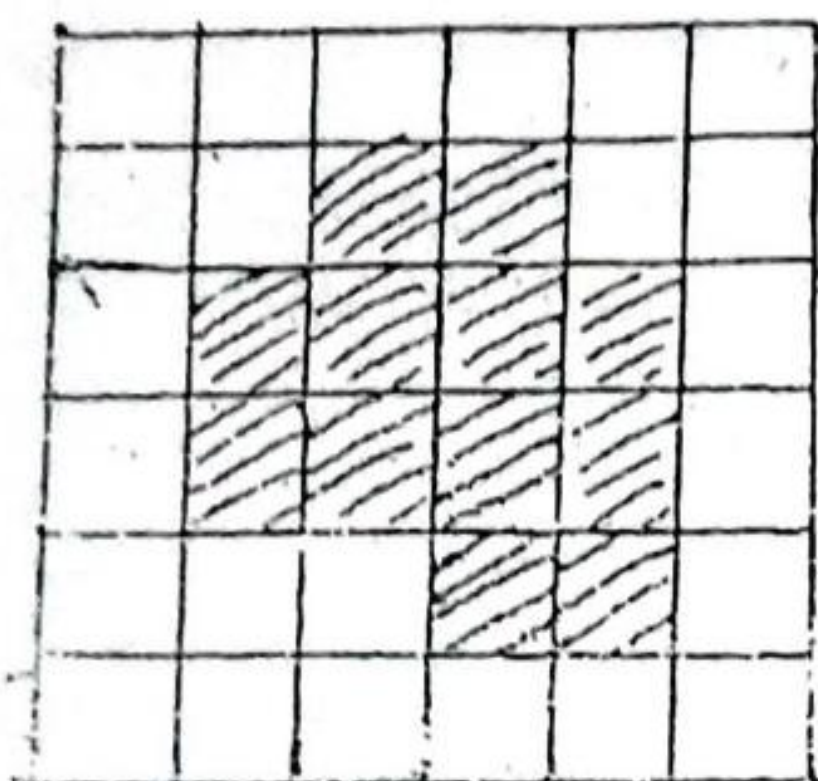
- i) Boundary length
- ii) Curvature
- iii) Signature
- iv) Eccentricity

c) Explain pattern matching by using correlation.

8. a) Explain with examples the use of vector, string and tree data structures for pattern representation.

b) Explain pattern matching using minimum distance classification.

c) What are chain codes used for? Obtain the chain code for the image given below:



B.E. (IT) (Semester – VIII) (RC) (2007-08) Examination, May/June 2018
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- Instructions :** 1) Attempt **any five** questions, selecting at least **one** question from **each** Module.
 2) Make appropriate assumptions **wherever** necessary.
 3) **Draw** figures and sketches **wherever** necessary.

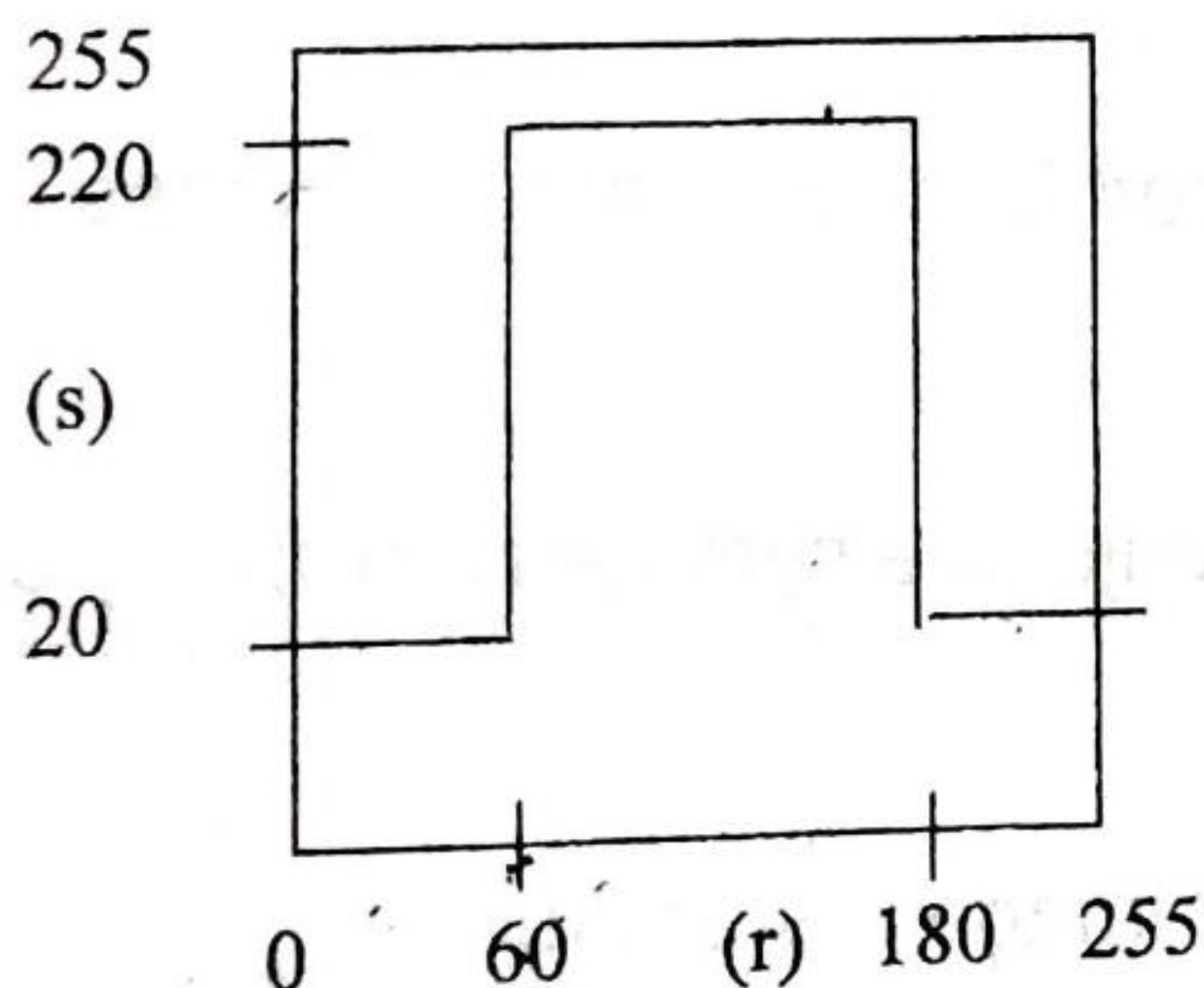
MODULE – I

1. a) Consider a 3×3 image given below :

6

$$\begin{pmatrix} 30 & 165 & 30 \\ 70 & 165 & 70 \\ 210 & 165 & 210 \end{pmatrix}$$

- i) The above image is transformed using the point transformation shown in figure below (r and s are variables denoting the gray level of input and output image respectively). Write pixel values of the processed image.



- ii) Perform negative transformation on the given image.

- iii) Write the 3rd bit plane of the given image.

- b) Explain the use of second order derivatives for image enhancement. 8
 c) Discuss the different components of image processing system with block diagram. 6

P.T.O.



2. a) Consider the 4x4 image given below :

0	3	5	1
2	3	5	1
2	4	4	6
2	4	4	7

Write the processed image when the following techniques are applied to the image with padding bit 0 :

- i) Median Filtering 6
- ii) 3 x 3 low pass filtering. 6
- b) Explain Unsharp masking and High-boost filtering. 6
- c) Explain the process of digitizing an image. What are the factors that affect the process of digitization ? 8

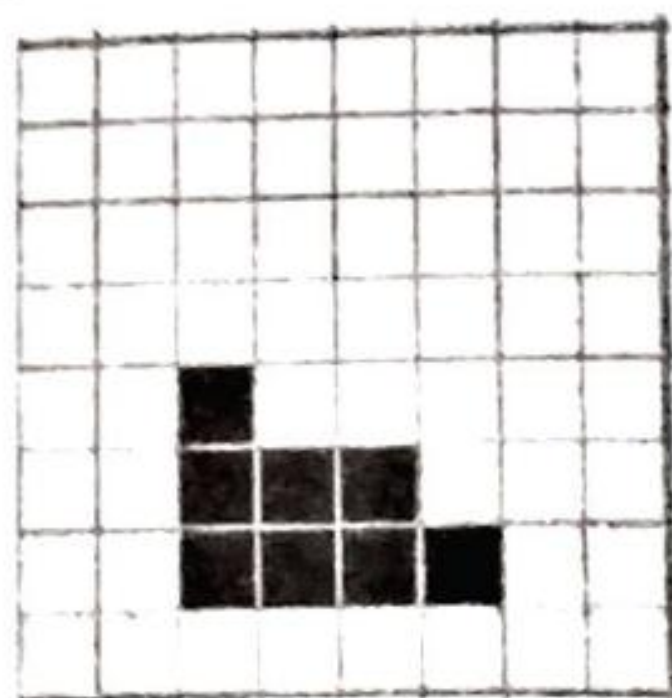
MODULE – II

- 3. a) Explain various mean spatial filters used for restoration of images in the presence of noise only. 6
- b) Explain the rotation, periodicity and conjugate symmetry property of two dimensional Fourier Transform. 8
- c) Explain Weiner Filtering technique for image restoration. 6
- 4. a) Explain various order statistics spatial filters used for restoration of images in the presence of noise only. 6
- b) Explain the ideal and Butterworth high pass filters. 6
- c) Briefly explain the inverse filtering approach and its limitations in image restoration. 8



MODULE – III

5. a) What is thresholding ? Explain Basic global thresholding and specify the algorithm for obtaining threshold value. 8
- b) Perform dilation and erosion of the image A with structuring element B given below : 6



A



B

- c) Explain the RGB model for color images. 6
6. a) Compare and explain basic adaptive thresholding and basic global thresholding. 8
- b) Explain hit – or – miss Transform with a suitable example. State its applications. 6
- c) Explain how color image smoothing and sharpening is carried out. 6

MODULE – IV

7. a) Explain how shape numbers can be used pattern recognition by matching. 6
- b) Explain the following descriptors with examples.
- i) Signatures
 - ii) Topological descriptors 8
 - iii) Fourier descriptors.
- c) Discuss the Medial Axis transformation (MAT) for a region R. Draw the medial axis of the square, equilateral triangle and circle. 6

