



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

Duration : 3 Hours

Total Marks : 100

Instructions : 1) Answer **any five** questions with atleast **one** question from **each** module.

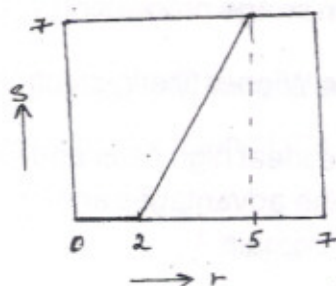
2) Draw **neat** labelled diagrams **wherever** necessary.

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 :
 - i) Spatial and gray level resolution 3
 - ii) Checker board and false contouring effects. 3
- 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



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. 8

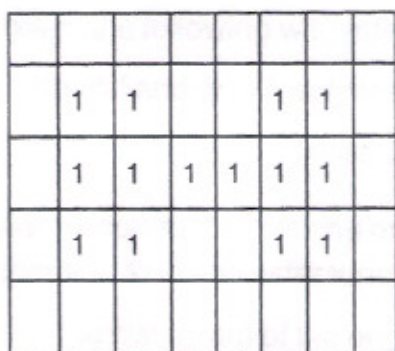


Figure 1

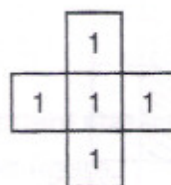
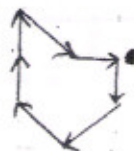


Figure 2

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. 8

i) Boundary length

ii) Curvature

iii) Signature

iv) Eccentricity

c) Explain pattern matching by using correlation. 6

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

b) Explain pattern matching using minimum distance classifier. 6

c) What are chain codes used for ? Obtain the chain code for the image given below : 6

