

[Total No. of Questions : 8]

**B.E. (IT) (Semester - VIII) (RC) Examination, Nov. - 2011**  
**IMAGE PROCESSING & PATTERN RECOGNITION**

Duration : 3 Hours

Total Marks : 100

- Instructions :** 1) Answer any five questions, with at least one from each Module.  
 2) Make suitable assumptions wherever necessary.  
 3) Assume suitable data wherever required.

**MODULE - I**

- Q1)** a) With the help of block diagrams, explain the different components of an image acquisition system. [7]  
 b) What do you understand by spatial and gray-level resolution of a digital image? Discuss the simple model used for representation of a monochromatic digital image. [6]  
 c) An image having 8 levels of gray scale (0-7) is given below :

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

Calculate the resulting image when each of the following techniques are applied to the above image.

- i) negative of image [2]  
 ii) contrast stretching using point processing when  $(r_1, s_1) = (2, 1)$  and  $(r_2, s_2) = (4, 7)$  [3]  
 iii) Zooming the image by a factor of 2-using replication. [2]

- Q2)** a) What do you understand by low pass spatial filtering of an image? How is it implemented using spatial marks? [6]  
 b) How do you define gradient of an image? How can gradient be used as a spatial filter to detect edges in images. [7]  
 c) Explain the use of second order derivatives for image sharpening. [7]

**MODULE - II**

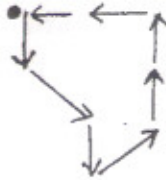
- Q3)** a) What do you understand by filtering of an image in the frequency domain? What is its importance? Explain the principle of ideal low pass filtering in the frequency domain. [8]
- b) Explain the following properties of the fourier transform :
- i) separability [3]
  - ii) translation [3]
- c) Define operation between two-dimensional discrete functions. Explain briefly the application of this operation in image processing. [6]
- Q4)** a) What is the goal of image restoration? How can inverse filtering be used for restoration of an image? [6]
- b) Explain the following high pass filters in the frequency domain : [6]
- i) Butterworth high pass filter
  - ii) Gaussian high pass filter
- c) Explain the Wiener filtering technique for image restoration. [8]

**MODULE - III**

- Q5)** a) Discuss the HSI color model. Why is this model suitable for image processing over the RGB model? [5]
- b) Explain the following enhancement techniques with reference to color images : [8]
- i) Image smoothing
  - ii) Image sharpening
- c) Explain the detection of straight lines using Hough Transform. [7]
- Q6)** a) What do you understand by image thresholding? Explain the various techniques to obtain threshold value. [8]
- b) What do you understand by 'morphology' processing? [2]
- c) Explain the hit-or-miss transform with a suitable example. State its applications. [5]
- d) How would you perform region filling using morphological operations? Explain with an example. [5]

MODULE - IV

- Q7) a) For the image boundary shown below, write down the : [6]
- i) chain code starting at the location of the large dot
  - ii) first differences of chain code
  - iii) shape number



- b) Write short notes on the following boundary descriptors :
- i) Fourier Descriptors [5]
  - ii) Statistical Moments [5]
- c) Explain how correlation between two functions can be used for pattern matching. [4]

- Q8) a) Explain in brief the following boundary descriptors
- i) curvature [2]
  - ii) eccentricity [2]
  - iii) signature [3]
- b) State and explain the problem of pattern recognition. How can pattern recognition be achieved by using decision theoretic approach? [8]
- c) Explain with examples the use of string and tree data structures for pattern representation. [5]

