G - 1013 (Pages : 02) IT 8-1 (RC)

[Total No. of Questions : 8]

B.E. (IT) (Semester - VIII) Examination, May 2011
IMAGE PROCESSING AND PATTERN RECOGNITION

Duration : 3 Hours **Total Marks : 100**

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

MODULE - I

Q1) a) List and explain the elements of a general purpose digital image processing system. **[8]**

b) With the help of graphs explain how the graylevels of the given image (r) are transformed to the graylevels of processed image (s) for the following techniques.
i) image negatives.
ii) log transformations.
iii) power law transformations. **[8]**

c) What do you understand by contrast of an image? What is contrast stretching? **[4]**

Q2) a) For the image given below, calculate the final processed image when the following filters are applied : **[6]**
i) Median filter.
ii) Max filter.

$$\begin{bmatrix} 0 & 1 & 3 & 4 \\ 3 & 4 & 5 & 6 \\ 2 & 0 & 1 & 3 \\ 1 & 4 & 3 & 2 \end{bmatrix}$$

b) Explain the following image enhancement techniques :
i) Image subtraction and averaging. **[4]**
ii) Gray-level slicing. **[3]**

c) How do you define gradient in an image? Explain the approximations in gradient used in sobel operators. How are there operators used in edge detection? **[7]**

MODULE - II

Q3) a) Define the fourier transform of an image function and its inverse transform. **[4]**

b) Explain the periodicity and conjugate symmetry property of the Fourier transform. **[3]**

c) Explain the following low pass filters in the frequency domain : **[8]**
i) Butterworth low pass filter.
ii) Gaussian low pass filter.

P.T.O.

d) What is the goal of image restoration? Explain the system model for image restoration process. [5]

Q4) a) Define convolution and correlation operations between two two-dimensional discrete functions. State the applications of these operations in image processing. [6]

b) Explain how inverse filtering can be used for restoration of an image. [6]

c) Explain Wiener filtering technique for image restoration. [8]

MODULE - III

Q5) a) Discuss the HSI color model. Given that the R, G, B colors for a pixel are (100, 200, 50) respectively compute the corresponding H, S, I values of the pixel. [7]

b) Explain the color slicing enhancement technique. [5]

c) Explain the basic formulation of region-oriented segmentation. Hence, explain the region growing by pixel aggregation segmentation technique. [8]

Q6) a) Explain the detection of straight lines using though transform with suitable examples. [8]

b) Define the opening and closing morphological operations with a structuring element on an image. Explain the physical significance of these operations. What is the effect of these operations on an image? [8]

c) Define and explain the effect of the following morphological operations on a binary image : [4]

i) Dilation.

ii) Erosion.

MODULE - IV

Q7) a) Explain the following schemes for representation of boundary of an image.

i) Chain codes. [4]

ii) Signatures. [4]

b) Briefly describe the following techniques.

i) Pattern matching by minimum distance qualifier. [6]

ii) Pattern matching by using correlation. [6]

Q8) a) Explain the following boundary descriptors.

i) Fourier Descriptors. [5]

ii) Statistical Moments. [5]

b) Explain with examples the use of vector, string and tree data structures for pattern representation. [7]

c) Explain topological regional descriptors. [3]

☒☒☒☒