



B.E. (IT) VIII Semester Examination, Nov./Dec. 2012
IMAGE PROCESSING AND PATTERN RECOGNITION (RC)

Duration : 3 Hours

Total Marks : 100

Instruction : Answer **any five** questions, choosing at least **one** from **each** Module.

MODULE – I

1. a) What do you understand by the terms 'Checker board effect' and 'False contouring' in a digital image ? Why are these effects produced ? Suggest remedial measures. 6
- b) Explain the structure of the human eye and how an image is formed in the eye. 8
- c) Explain the use of finding connectivity between pixels. Explain the methods used to find connectivity between pixels. 6
2. a) With the help of graphs explain how the gray levels of the given image (r) are transformed to gray levels of processed image (s) for the following techniques :
 - i) Image negative 2
 - ii) Log transformations 2
 - iii) Gray level slicing. 3
- b) An image matrix $[A]$ is given below :
$$[A] = \begin{bmatrix} 0 & 2 & 2 & 2 \\ 3 & 3 & 4 & 4 \\ 5 & 5 & 4 & 4 \\ 1 & 1 & 6 & 7 \end{bmatrix}$$

Write matrices for the processed image when the following techniques are applied to the image :

 - i) Median filtering. 2
 - ii) Contrast stretching using point processing when $(r_1, s_1) = (2, 1)$ and $(r_2, s_2) = (4, 7)$. 3
 - iii) Low-pass filtering using a 3×3 mask. 3
- c) What are bit plane images ? What is the use of extracting bit plane images of an image ? 5

P.T.O.



MODULE – II

3. a) Given that $f(x) = \{0, 1, 2, 3\}$. Find $F(u)$ using the definition of Discrete Fourier Transform. 6
- b) Explain the Gaussian high pass filter. 6
- c) What is image restoration? How can inverse filtering be used for restoration of an image? 8
4. a) What do you understand by the term 'Noise Model'? Explain any three noise models commonly used in image processing. 8
- b) Define the Fourier transform of an image $f(x, y)$. Explain how the property of separation makes it possible to calculate two dimensional Fourier transform from one-dimensional Fourier transform. 5
- c) What do you understand by filtering an image in the frequency domain? What is its importance? Explain the principle of ideal low pass filtering in the frequency domain. 7

MODULE – III

5. a) Explain the color slicing technique and its use. 6
- b) Perform the following operations on the binary image given in figure 1 with the structuring element given in figure 2.
- Dilation
 - Erosion.

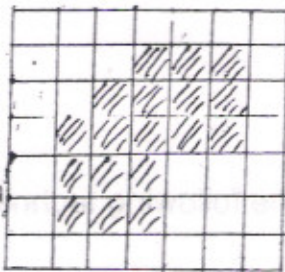


Figure 1

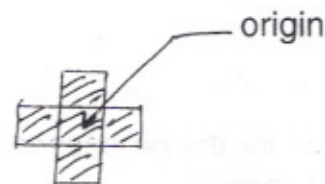


Figure 2

- c) Explain the basic formulation of region oriented segmentation. Hence explain the segmentation technique with region growing by pixel aggregation. What are the problems associated with this method? 8



6. a) Explain the split and merge segmentation technique. Apply the technique for the following image. Show the resultant quad tree. 8
- ```
77772222
77772222
77777711
77777711
27771111
20771111
00111111
00011111
```
- b) Explain the RGB color model. 6
- c) Define the following morphological operations. State their effect on a binary image. 6
- i) Opening
  - ii) Closing.

MODULE - IV

7. a) What is the difference between contour based and region-based descriptors? Write a short note on region-based descriptors. 5
- b) Explain any one structural method used for pattern recognition. 7
- c) Briefly describe the following techniques : 8
- i) Pattern matching by minimum distance qualifier
  - ii) Pattern matching by using correlation.
8. a) Explain with an example how signatures are used for representation of image boundary. 4
- b) Write a note on Optimum Statistical Classifier. 10
- c) Explain how decision functions are used to classify an image into corresponding pattern class. 6