

2074  
B.E. (Computer Science and Engineering)  
Seventh Semester  
CS-701: Digital Image Processing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

Q1.

- (i) Where you need non-uniform sampling and quantization?
- (ii) Suppose an image has dimension 4x6 inches has details to frequency of 400 per inch in each direction. How many samples are required to preserve the information in the image?
- (iii) Distinguish between a monochrome and grayscale image.
- (iv) What is difference between convolution and correlation?
- (v) What is pseudo coloring?
- (vi) Give any three applications in our daily life, which could use image segmentation.
- (vii) Define shape numbers.
- (viii) What is Psychovisual redundancy?
- (ix) Provide the linear filter mask to find vertical edges in an image.
- (x) Briefly describe the various applications of object recognition.

(10x1)

SECTION - A

- Q2. (a) What do you understand by image acquisition? Discuss the various methods of image acquisition. (6)
- (b) Convolution is one of the most important operation in digital image processing. Prove that convolution in spatial domain is equal to multiplication in frequency domain. (4)
- Q3. (a) Apply the following filters on the given image given below and show the intermediate results. (6)
- i. Low-pass filter
  - ii. High-pass filter
  - iii. Median filter
- 1 3 5  
4 4 3  
5 2 2
- (b) What is Fourier transform? Discuss its various properties. (4)
- Q4. (a) A photograph is being taken through front window of a car moving a constant velocity on a flat road. Because of the movement of the car, the image is distorted. Discuss which kind of distortion has been there in this situation. (3)
- (b) Briefly explain inverse filtering. What are the drawbacks of inverse filtering? (3)

Contd.....P/2



(2)

- (c) What is histogram equalization? Perform the histogram equalization of the following image: (4)

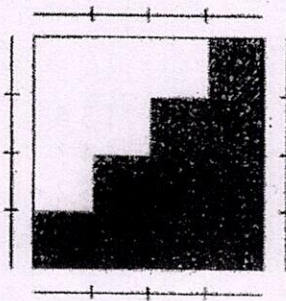
4	4	4	4	4
3	4	5	5	3
3	5	5	5	3
3	4	5	4	3
4	4	4	4	4

### SECTION-B

- Q5. (a) Explain how Fourier descriptors are used for boundary description of any digital boundary in xy plane. (5)
- (b) For the image shown below, computer the degree of compression that can be achieved using (a) Huffman coding (b) run-length coding. Assuming two bits to represent pixel value and two bits to represent run length. (4)

3	3	3	2
2	3	3	3
3	2	2	2
2	1	1	0

- (c) Determine whether the code {0,01,11} is uniquely decodable or not. (1)
- Q6. (a) Describe about region based image segmentation methods. How are they better than thresholding methods. (5)
- (b) Discuss Split and merge segmentation technique. Apply split and merge segmentation on the following image (5)



- Q7. (a) Distinguish between statistical and structural approaches of pattern recognition. (5)
- (b) Texture is an important regional descriptor and it could be found by using co-occurrence matrices. Consider a binary image of size 200x200 pixels, with a vertical black band extending from columns 1 to 99 and a vertical white band extending from columns 100 to 200. (2,1,2)
- (i) Obtain the co-occurrence matrix of this image using the position operator "one pixel to the right."
  - (ii) Normalize this matrix so that its elements become probability estimates,
  - (iii) Compute the six texture descriptors.