

2072  
M.E. (Computer Science and Engineering)  
Second Semester  
CS-8201: 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

I. Write short answers of the following:

- What is the goal of digital image processing?
- Differentiate between image restoration and image enhancement.
- What is contrast stretching? What is its use?
- What is spatial averaging? What is the effect of filter size on spatial averaging?
- What is Hough transform? What is its use?

(2 marks each)

**Section-A**

II.

- What is meant by sampling and quantization? How do they affect the quality of an image?
- Derive the transformation function for histogram equalization. What are the conditions that this transformation function should follow?

(5,5)

III.

- What would happen if low- or high-pass filters are repeatedly applied to an image? Is this repeated operation helpful in any way?
- Suppose that a digital image is subjected to histogram equalization. Show that a second pass of histogram equalization will produce exactly the same result as the first pass.

(5,5)

IV. Consider the simple  $4 \times 8$ , 8-bit image:

21	21	21	96	169	243	243	243
21	21	21	96	169	243	243	243
21	21	21	96	169	243	243	243
21	21	21	96	169	243	243	243

- Compute the entropy of the image.
- Compress the image using Huffman coding.
- Compute the compression achieved and the effectiveness of the Huffman coding.
- Consider coding the differences between adjacent pixels. What is the entropy of the new difference image? What does this tell us about compressing the image?

(2,2,3,3)

**Section-B**

V.

- How are boundaries represented using Chain Codes? What are reasons that make this code unacceptable? How is chain code normalized with respect to starting point and rotation?
- With the help of an example, describe in detail dilation, erosion, opening and closing morphological operations.

(5,5)

VI.

- What do you mean by global thresholding? Describe in brief how edges can be used to improve global thresholding.
- What do you mean by texture? Describe various statistical measures used to describe texture.

(5,5)

VII.

- What is an edge? Why edge detection is said to be a low-level image processing operation? Describe in brief various methods for detecting edges in a grayscale image.
- Describe in brief object recognition based on decision-theoretic methods.

(5,5)

x-x-x