

2122
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 Unit.

x-x-x

I. Attempt the following:-

- a) What is Bit depth? Write the expression to find the number of bits to store a digital image?
- b) Define pixel or picture element.
- c) Write the expression of two-dimensional discrete Fourier transforms?
- d) Define Derivative filter?
- e) What is the homogeneity property and what is the significance of this property?
- f) When does the degradation model satisfy position invariant property?
- g) Find the number of bits to store a 128X128 image with 64 gray levels.
- h) What are the basic operations of source encoder?
- i) What are the three types of discontinuity in digital image?
- j) Define Chain codes and its use? Is this a lossy or non-lossy technique? (10x1)

UNIT - I

- II. a) Explain in brief various object recognition techniques.
b) Perform Histogram equalization of the 5X5 image with data as below.

Gray levels	0	1	2	3	4	5	6	7
Number of pixels	0	0	0	6	14	5	0	0

(2x5)

- III. a) Explain region splitting and merging algorithm for segmentation in detail.
b) What is the use of boundary characteristics in image segmentation? Discuss boundary descriptors. Plot the signature of the following boundaries:
i) An equilateral triangle
ii) A rectangle (2x5)

- IV. a) Why do we need to compress an image? Name various image compression methods and explain in brief the various types of redundancies exploited by various compression methods.
b) What is the color model and its role in image processing? Explain the HSI color model and compare it with RGB and CMY color models. Also Discuss the procedure for conversion from HSI to RGB color model. (2x5)

(2)

UNIT - II

- V. a) Give a spatial relationship and corresponding tree representation for a checker-board pattern of black and white squares. Assume that the top left element is black and the root of the tree corresponds to that element. Your tree can have no more than two branches emanating from each node.
- b) Show that redefining the starting point of a chain code so that the resulting sequence of numbers forms an integer of minimum magnitude makes the code independent of the initial starting point on the boundary. (2x5)
- VI. a) Using the continuous 2D convolution and Fourier transform expressions, prove that convolution in the space domain is equivalent to multiplication of the corresponding functions in the Fourier domain.
- b) Explain region splitting and merging algorithm for segmentation in detail. (2x5)
- VII. a) Generate a binary sequence of length L with $P(0) = 0.8$, and use the arithmetic coding algorithm to encode it. Plot the difference of the rate in bits/symbol and the entropy as a function of L . Comment on the effect of L on the rate.
- b) Explain in brief various object recognition techniques. (2x5)

x-x-x