1129
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 Inverse filtering?   (1)

   b) Briefly give some methods for image acquisition.   (1)

   c) What is HSI Color model and how it could be converted to RGB?   (2)

   d) Describe how Sobel operator could be used for horizontal and vertical edges?

   e) Explain Huffman coding with an example.   (2)

   f) Texture regional descriptor 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. Obtain the co-occurrence matrix of this image using the position operator "one pixel to the right."   (2)

UNIT – I

II. a) Explain how sampling and quantization effect the quality of a digital image?

   b) Compare histogram equalization with histogram specification. Which one is better and why?

   c) Apply histogram equalization on the following 5x5 image:

6	2	3	4	5
5	5	6	7	5
5	6	4	8	6
4	7	4	3	4
8	5	6	6	7

                                                                              (3,4,3)

III. a) Discuss the different ways of estimating the degradation function for the use in image restoration.

   b) What is noise? Sometimes an image is only degraded by noise, describe various spatial filtering methods which could be applied for image restoration.

   c) If we apply 2D-DFT to a homogenous image having same intensity values, what would be the output? Explain.   (4,2,4)

                                                                              P.T.O.

IV.   a) One approach for approximating a discrete derivative in 2-D is based on computing differences of the form f(x+1,y) - f(x,y) and f(x,y+1) - f(x,y). Find the equivalent filter H(u,v) in the frequency domain and show that it is a highpass filter.

b) Give a single intensity transformation function for spreading the intensities of an image so the lowest intensity is 0 and the highest L-1.

c) What is a Wavelet transform? Compute the Haar transform of the 2x2 image

$$F = \begin{bmatrix} 3 & 1 \\ 6 & -2 \end{bmatrix}$$

UNIT – II

V.   a) Write short note on following:

i) Coding redundancy

ii) Psychovisual redundancy

b) Suppose that the intensities of an image f(x,y) are in the range [0, 1] and that a threshold T, successfully segmented the image into objects and background. Show that the threshold T'=1-T will successfully segment the negative of f(x,y) into the same regions.

c) Discuss Hough transform for line detection.   (4,4,2)

VI.   a) Describe an Edge and boundary linking algorithm.

b) What are the stages of Canny edge detector? Explain each phase.

c) Compute the first difference of the code

0101030303323232212111   (5,3,2)

VII.   a) 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.   (3)

b) Explain the principle of following region-based segmentation procedures:-

i) Region growing

ii) Region splitting

iii) Split and merge Also mention the difference between these approaches   (2,2,2,1)

x-x-x