

1078

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) What is sampling and quantization?
- (ii) Apply DFT on the following matrix

A =

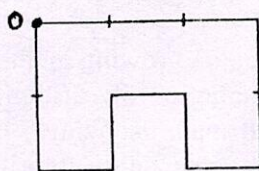
2	2
0	1

- (iii) Determine CIE chromaticity coordinates of point given C1 = (0.14, 0.4, 2) and C2 = (0.51, 0.6, 1). Find the third color C3.

- (iv) What is Huffman coding? Calculate the Huffman Coding for the following set of symbols:

Symbol	A	B	C	D
Probability	0.4	0.3	0.2	0.1

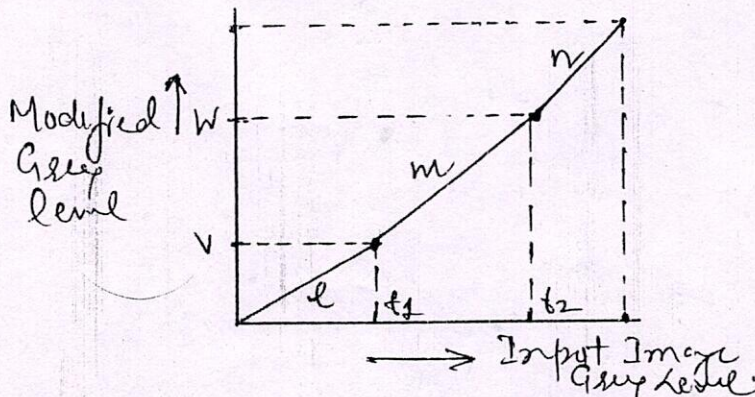
- (v) Consider the following shape and write corresponding 4-directional and 8-directional chain codes. Perform normalization also.



(5x2)

SECTION - A

- Q2. (a) What do you understand by image enhancement? How contrast stretching is used for image enhancement? What would be the dynamic range of the following image if the slopes of the image are given as l=0.2, m=0.5 and n=0.1? (5)



- Q2. (b) Write a procedure for histogram equalization. Perform image enhancement (5)

P.T.O.

for 8x8 image distribution shown below:

Gray level	0	1	2	3	4	5	6	7
# of pixels	8	10	10	2	12	16	4	2

- Q3. (a) What are the advantages of frequency domain filters over spatial domain filters? (3)
- (b) Consider a spatial mask that averages the four closest neighbors of a point (x, y) , but excludes the point itself from the average. Find the equivalent filter, $H(u,v)$, in the frequency domain. Show that result is a low pass filter. (4)
- (c) Describe how Homomorphism filtering is used for image restoration? (3)
- Q4. (a) Briefly explain HSI and RGB color models. Describe how HSI model could be converted to RGB model? (5)
- (b) What is noise? Discuss various types of noise models used for modeling the noise present in images. Also name various noise reduction filters. (5)

SECTION-B

- Q5. (a) Differentiate between local and global thresholding. Write an algorithm for performing adaptive thresholding on digital images. (4)
- (b) Given a four-symbol source $\{a, b, c, d\}$ with source probabilities $\{0.1, 0.4, 0.3, 0.2\}$, arithmetically encode the sequence $bbadc$. (3)
- (c) Discuss the different kind of redundancies present in an image. (3)
- Q6. (a) Describe the seeded region growing method for segmentation of an image. (4)
- (b) What are the advantages of arithmetic encoding compared with disadvantages of Huffman encoding? Encode a sequence of symbols BABAB using arithmetic encoding algorithm for $p_A=1/5$ and $p_B=4/5$. (6)
- Q7. (a) A binary image contains straight lines oriented horizontally, vertically, at 45° , and at -45° . Give a set of masks that can be used to detect 1-pixel breaks in these lines. Assume that the intensities of the lines and background are 1 and 0, respectively. Justify your answer. (4)
- (b) Describe the edge linking process using Hough transform. (3)
- (c) Write a short note on JPEG compression standard. (3)

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