Exam.Code:0919
Sub. Code: 6802

1079

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 difference between image enhancement and image restoration?
(ii) What is need of using homomorphic filtering?
(iii) What is the requirement of edge linking?
(iv) Briefly explain how discontinuity is detected in a digital image?
(v) What do you mean by color model?
(vi) Define the term interpixel redundancy with suitable example.
(vii) Give the applications if regional descriptors.
(viii) Whether using the chain code compress description in formation of an object shape?
(ix) What is wavelet transform? How is it better than Fourier transform?
(x) Briefly explain Hough transform.

SECTION – A

Q2. (a) What are the various steps in image processing? Explain briefly. (5)

(b) We know that the dc term, F(0, 0), of a DFT is proportional to the average value of its corresponding spatial image. Assume that the image is of size MxN. Suppose that we pad the image with zeros to size PXQ, where P and Q are the smallest even integers those satisfy the conditions as; P >= 2M-1 and Q >= 2N-1. Let $F_p(0,0)$ denote the dc term of the DFT of the padded function. (5)

(i) What is the ratio of the average values of the original and padded images?

(ii) Is $F_p(0,0) = F(0,0)$?Support your answer mathematically.

Q3. (a) Discuss how image sharpening is done with help of Laplacian. Explain in detail why a Laplacian with a -8 at centre yields sharper result than the one with -4 in centre. (4)

(b) Describe pseudocolor image processing. (4)

(c) Show how we can transform from HSI to RGB color space. (2)

Q4. (a) Compare and contrast deterministic and stochastic methods of image restoration. (6)

(b) Given an image of size MxN, you are asked to perform an experiment that consists of repeatedly lowpass filtering the image using a Gaussian lowpass filter with a given cutoff frequency D_0. You may ignore computational round-off errors. Let C_{min} denote the smallest positive number representable in the machine in which the proposed experiment will be conducted. Let K denote the number of applications of the filter. Can you predict (without doing the experiment) what the result (image) will be for a sufficiently large value of K? If so, what is that result? (4)

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SECTION-B

Q5. (a) Find a set of code words and average word length using Huffman coding scheme for a set of input gray levels with probabilities as given below: (5)

Symbol	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8
Probability	0.02	0.15	0.03	0.15	0.05	0.20	0.10	0.30

Compute the lowest possible average bits per gray level required to represent this data.

(b) Explain the different edge operators and comapre them. (5)

Q6. (a) Obtain the gray-level co-occurrence matrix of a 5x5 image composed of a checkerboard of alternating 1s and 0s if (4)

(i) the position operator is defined as "one pixel to the right," and

(ii) the position operator is defined as "two pixels to the right."

Assume that the top left pixel has value 0..

(b) Shape is one of the most important feature of an obejct. Signature is one method of boundary representation. Find an expression for the signature of rectangular boundary, and plot the signature. (3)

(c) Write a short note on JPEG image compression standard. (3)

Q7. (a) Describe how Fourier descriptors are used for boundary description? (4)

(b) Segmentation of an image could be done by using basic global thresholding algorithm. Modify the algorithm so that it uses the histogram of an image instead of the image itself. (3)

(c) Brifly explain arithmetic coding used for image compression. (3)

x-x-x