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10EC763

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020

Image Processing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define a digital image. With neat diagram, explain the components of image processing system. **(10 Marks)**

b. Briefly explain:
i) Brightness adaptation and discrimination
ii) Weber ratio
iii) Mach bands **(10 Marks)**

2 a. Explain in detail the image acquisition using the three principal sensor arrangements. **(10 Marks)**

b. Consider the two image subsets, S_1 and S_2, shown in the Fig.Q2(b). For V = {1}, determine and explain whether these are (i) 4-adjacent (ii) 8-adjacent (iii) m-adjacent.

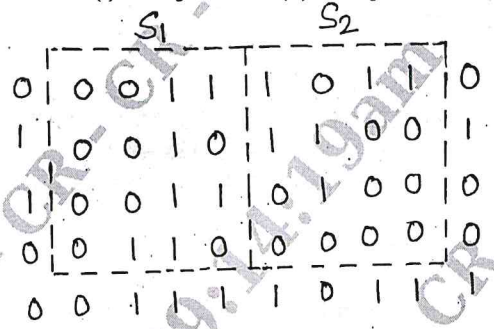

Fig.Q2(b) **(06 Marks)**

c. Consider the image shown in Fig.Q2(c). Let V = {1, 2}
(i) compute length of shortest m-path
(ii) compute D_4 distance between the points p and q.

	3	0	2	1
	2	2	0	2
	1	2	1	1
(p)	1	0	1	2

(q)

Fig.Q2(c) **(04 Marks)**

3 a. Define unitary transforms. Explain the properties of unitary transforms. **(06 Marks)**

b. Calculate the transformed image V and the basis images for the orthogonal matrix A and image U.

$$A = \frac{1}{\sqrt{2}}\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} \qquad U = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$$ **(06 Marks)**

c. Explain in brief the following properties of 2D – Discrete Fourier Transforms:
(i) Separability (ii) Translation **(08 Marks)**

4 a. Define 2-D forward and inverse discrete cosine transform, and mention its properties. **(08 Marks)**

b. Generate 8 × 8 Hadamard transform matrix. The core matrix $H_1 = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ indicate its sequency. **(04 Marks)**

c. Explain Haar transformation with its properties. Compute Haar transformation of image $F = \begin{bmatrix} 3 & -1 \\ 6 & 2 \end{bmatrix}$. **(08 Marks)**

PART – B

5 a. With necessary graphs, explain the spatial enhancement operations:
   i) Power law transformation
   ii) Gray level slicing
   iii) Contrast stretching
   iv) Bit plane slicing **(12 Marks)**

b. Derive the equation for histogram equalization. **(08 Marks)**

6 a. Explain with a block diagram, the basic steps for image filtering in frequency domain. **(08 Marks)**

b. Explain highpass butterworth filter. **(06 Marks)**

c. List the steps involved in homomorphic filtering. **(06 Marks)**

7 a. Explain the basic model for image degradation/restoration process. **(06 Marks)**

b. Explain inverse filtering with necessary equations. **(06 Marks)**

c. Explain any four noise models with necessary equations and graphs. **(08 Marks)**

8 a. Explain different color models. **(10 Marks)**

b. Explain pseudo coloring. **(06 Marks)**

c. How many minutes it will take to transmit a 1024 × 1024 colour image with 256 shades of RGB. Assume 56 Kbps modem is used for transmission? **(04 Marks)**

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