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10EC763

Seventh Semester B.E. Degree Examination, June/July 2019
Image Processing

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat block diagram, explain the components of a general purpose image processing system. **(10 Marks)**

b. Explain the following terms as applicable to image processing with necessary graphs.

c. i) Brightness adaptation
ii) Weber ratio
iii) Mach bands. **(10 Marks)**

2 a. Explain the concept of image sampling and quantization in image processing with an example. **(08 Marks)**

b. Consider the image segment given in Fig.Q2(b). Let v = {2, 3, 4}, compute the lengths of the shortest 4, 8 and m path between 'p' and 'q'. If path does not exists explain why? **(06 Marks)**

	3	4	1	2	0	
	0	1	0	4	2	(q)
	2	2	3	1	4	
(p)	3	0	4	2	1	
	1	2	0	3	4	

Fig.Q2(b)

c. Let p and q are the two pixels at co-ordinates (100, 200) and (150, 190) respectively. Compute :
i) Euclidean distance ii) city block distance iii) chessboard distance. **(06 Marks)**

3 a. For the 2 × 2 transform A and the image U,

$$A = \frac{1}{2}\begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{bmatrix} \quad U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$$

Calculate the transformed image V and the basis image. Also reconstruct the original image. **(10 Marks)**

b. Explain any three properties of two dimensional Discrete Fourier transform. **(06 Marks)**

c. Write a note on separable unitary transforms. **(04 Marks)**

4 a. Give an expression for 2D discrete sine transform and discuss its properties. **(10 Marks)**

b. Generate Hadamard transform matrix H_n for n = 2, 3 for the given core matrix :

$$H_1 = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}.$$ **(08 Marks)**

c. State any two properties of SLANT transform. **(02 Marks)**

PART – B

5 a. Explain the following with applications :
   i) Contrast stretching
   ii) Bit plane slicing
   iii) Grey level slicing
   iv) AND operation. **(10 Marks)**

b. For the image shown in Fig. Q5(b), plot the histograms before and after the histogram equalization. **(10 Marks)**

$$\begin{bmatrix} 2 & 3 & 3 & 2 \\ 4 & 2 & 4 & 3 \\ 3 & 2 & 3 & 5 \\ 2 & 4 & 2 & 4 \end{bmatrix}$$

Fig. Q5(b)

6 a. Explain the following smoothing frequency domain filters and compair.
   i) Ideal lowpass filter
   ii) Gaussian pass filter. **(10 Marks)**

b. Illustrate homomorphism filtering process in image enhancement and derive the suitable result. **(10 Marks)**

7 a. Write a note on the following noise probability density functions :
   i) Gaussian noise
   ii) Rayleigh noise
   iii) Erlang noise
   iv) Exponential noise. **(12 Marks)**

b. Derive an expression of the linear degradation model in presence of additive noise. **(08 Marks)**

8 a. Explain the procedure for converting colors form (RGB) to HSI and vice-versa. **(10 Marks)**

b. What is pseudo color image processing? Explain gray level to color transformations. **(10 Marks)**

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