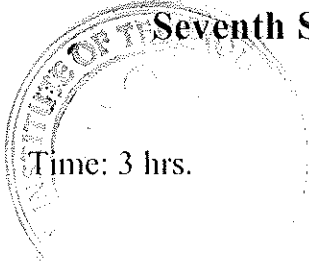


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10EC763



**Seventh Semester B.E. Degree Examination, June/July 2016**

**Image Processing**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least 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. Draw a neat cross sectional view of human eye and label its parts. (06 Marks)
- c. Discuss brightness discrimination and plot the typical weber ratio curves. (04 Marks)

- 2 a. With neat diagrams, explain image acquisition using linear and circular sensor strips. (10 Marks)
- b. Let the set of gray levels used to define connectivity be {94, 95, 96, 97} and compute the shortest  $D_4$  and  $D_8$  distances between pixels p and q for the image segment shown in Fig.Q2(b). Indicate the shortest path by double lines.

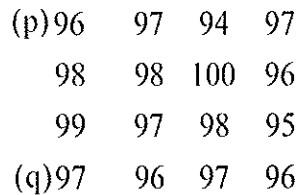


Fig.Q2(b)

- c. Let p and q are the two pixels at coordinates (100, 120) and (130, 160) respectively. Compute: i) Eucliden distance, ii) Chess board distance, iii) Manhattan distance. (06 Marks)
- 3 a. Give any three properties of unitary transforms. (06 Marks)
- b. Compute the 2D-DFT of the  $4 \times 4$  gray scale image given by

$$u(m, n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

(04 Marks)

- c. For the  $2 \times 2$  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 images. Also reconstruct the original image U by inverse transform. (10 Marks)

- 4 a. Generate Haar basis for  $N = 2$ . (08 Marks)
- b. Compute the K-L transform of the following matrix:

$$X = \begin{bmatrix} 4 & -2 \\ -1 & 3 \end{bmatrix}$$

(12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 4+8 = 50, will be treated as malpractice.

**PART – B**

- 5 a. Discuss histogram equalization for contrast enhancement. (10 Marks)  
 b. For the image shown in Fig.Q5(b), plot the histograms before and after the histogram equalization.

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

Fig.Q5(b)

(10 Marks)

- 6 a. Filter the image shown in Fig.Q6(a) by using a  $3 \times 3$  median filter mask and hence prove that median filtering minimizes salt and pepper noise.

$$\begin{bmatrix} 24 & 23 & 33 & 25 & 32 & 24 \\ 34 & 255 & 24 & 0 & 26 & 23 \\ 23 & 21 & 32 & 31 & 28 & 26 \end{bmatrix}$$

Fig.Q6(a)

(10 Marks)

- b. Explain a filtering approach for simultaneous dynamic range compression and contrast enhancement. (10 Marks)

- 7 a. Discuss adaptive median filtering method for image restoration. Also give its advantages. (10 Marks)  
 b. Derive the expression for observed image when the degradation are linear, position invariant. (10 Marks)

- 8 a. Explain the procedure for converting colors from RGB to HIS and vice-versa. (10 Marks)  
 b. Explain the concept of intensity slicing for pseudocolor image processing. (10 Marks)

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