USN | | | | | | | | | | |

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.

(p)	96	97	94	97
	98	98	100	96
	99	97	98	95
(q)	97	96	97	96

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

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 × 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 × 2 transform A and the image U,

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

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)**

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 × 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 psuedocolor image processing. **(10 Marks)**

* * * * *