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

10EC763

Seventh Semester B.E. Degree Examination, June/July 2014
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. What is a digital image? With block diagram, explain the fundamental steps in digital image processing. **(10 Marks)**

b. Write a short note on:
i) Image formation in the eye.
ii) Brightness adaptation in an eye. **(10 Marks)**

2 a. Explain an image acquisition using a sensor arrays. **(06 Marks)**

b. Briefly explain the following terms:
i) Neighbours
ii) Path
iii) Connectivity of pixels. **(06 Marks)**

c. Consider an image segment:

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

i) Let V = {0, 1, 2} compute the length of the shortest 4, 8m path between p and q.
ii) Repeat for V = {2, 3, 4}. **(08 Marks)**

3 a. Show that the DFT of the two dimensional circular convolution of two arrays are the product of their DFT's. **(10 Marks)**

b. For the given orthogonal matrix 'A' and image 'u', obtain transformed image, original image and basis image.

$$A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}, \quad u = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}.$$ **(10 Marks)**

4 a. Give an expression for 2D-forward and inverse discrete cosine transform and list its properties. **(08 Marks)**

b. Generate Hadmard transform matrix Hn for n = 3 from the core matrix

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

c. List the properties of Slant transform. **(04 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, 42+8 = 50, will be treated as malpractice.

PART – B

5 a. Explain the following: i) Gray-level slicing; ii) Bit plane slicing. **(06 Marks)**

b. For the given 4 × 4 image having grey scale between [0, 9], get histogram equalized image and draw the histogram of image before and after equalization. **(08 Marks)**

2	3	3	2
4	2	4	3
3	2	3	5
2	4	2	4

c. Briefly explain how arithmetic and logic operations are used for image enhancement. **(06 Marks)**

6 a. Explain and compare ideal low pass filter and Butterworth filter for image smoothing. **(10 Marks)**

b. What is homomorphic filtering? With block diagram, explain the homomorphic filtering approach for image enhancement and list the advantages. **(10 Marks)**

7 a. Draw and explain image degradation and restoration model. **(06 Marks)**

b. Discuss various mean filters used in image restoration system. **(06 Marks)**

c. Explain in brief the inverse filtering approach. List its limitations in image restoration. **(08 Marks)**

8 a. Briefly discuss the following:

i) RGB colour model.

ii) HIS color model. **(08 Marks)**

b. What is pseudo colour? Explain its processing technique. **(06 Marks)**

c. (R, G, B) = (0.683, 0.1608, 0.1922) convert this in to HIS model. **(06 Marks)**

* * * * *

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

06EC756

Seventh Semester B.E. Degree Examination, June/July 2014

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 the help of a block diagram, explain the fundamental steps in digital image processing. **(07 Marks)**

b. With a block diagram, explain the components of a general purpose image processing system. **(07 Marks)**

c. Explain any two applications of digital image processing. **(06 Marks)**

2 a. Explain image acquisition using sensor strips and sensor arrays. **(08 Marks)**

b. What do you mean by image sampling and quantization? **(06 Marks)**

c. With examples explain the following distance measures:
i) Euclidean ii) City-block iii) Chess-board **(06 Marks)**

3 a. Explain separability of unitary transforms and basis images. **(06 Marks)**

b. List few properties of unitary transforms. **(06 Marks)**

c. Given the orthogonal matrix 'A' and image 'u' find the transformed image and the basis images $A = \frac{1}{\sqrt{2}}\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$, $u = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. **(08 Marks)**

4 a. Write the expressions used to construct Haar transform of order N. Using these construct Haar transform for N = 2. **(10 Marks)**

b. Explain how an N × N Slant transform matrix is obtained by recursion. **(10 Marks)**

PART – B

5 a. Explain: i) Contrast stretching, ii) Gray level slicing, iii) Bit-plane slicing. **(06 Marks)**

b. What is an histogram? How does histogram of the following image look like:
i) Dark image ii) Bright image
iii) Low control image iv) High contrast image **(08 Marks)**

c. Explain high boost filtering. **(06 Marks)**

6 a. Explain homomorphic filtering approach for image enhancement. **(10 Marks)**

b. Explain five important noise probability density functions. **(10 Marks)**

7 a. Explain the following order statistic filters:
i) Median filter
ii) Max and min filters **(08 Marks)**

b. Explain minimum mean square error filter. **(12 Marks)**

8 a. What is HSI color model? Give the expressions for converting RGB to HSI and also for HSI to RGB. **(10 Marks)**

b. Write a note on full color image processing. **(10 Marks)**

* * * * *

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

10EC763

Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014

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 steps in image processing. **(10 Marks)**

b. Explain the following terms as applicable to image processing with necessary graphs:
i) Brightness adaptation
ii) Weber ratio
iii) Mach bands **(10 Marks)**

2 a. Discuss the role of sampling and quantization with an example. **(08 Marks)**

b. Explain the image acquisition using micro densitometer. **(06 Marks)**

c. Explain spatial resolution and gray level resolution of an image. **(06 Marks)**

3 a. Describe the following terms applied to image processing:
i) Neighbors of a pixel
ii) Adjacency of pixels
iii) Digital path
iv) City-block distance measure **(04 Marks)**

b. Let V = {0, 1}, compute D_e, D_4, D_8 distance between the pixels p and q for the Fig.Q3(b).

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

Fig.Q3(b) **(08 Marks)**

c. For the 2 × 2 transform 'A' and the image 'U', calculate the transformed image 'V' and basis images.

$$A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}; \qquad U = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$ **(08 Marks)**

4 a. Explain any four properties of two dimensional Fourier transform. **(08 Marks)**

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

c. Generate the Hadamard transform H_n matrix for n = 3. Given the core matrix $H_1 = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$. Also, indicate its sequency. **(04 Marks)**

PART – B

5 a. With necessary graphs, explain the following spatial image enhancement operations:
   i) Image negative
   ii) Log transformation
   iii) Power law transformation
   iv) Contrast stretching **(12 Marks)**

b. Perform histogram equalization of the 5 × 5 image whose data is shown in Table Q5(b).

Gray level	0	1	2	3	4	5	6	7
Number of pixels	0	0	0	6	14	5	0	0

Table Q5(b) **(08 Marks)**

6 a. Explain with a block diagram, the basic steps for image filtering in frequency domain. **(10 Marks)**

b. Illustrate Homomorphic filtering approach for image enhancement. Derive the suitable result. **(10 Marks)**

7 a. Explain the basic model of image restoration process. Also, with necessary equations, explain the most common PDFs in an image processing. **(10 Marks)**

b. With necessary mathematical equations, explain inverse filtering and Wiener filtering for image restoration. **(10 Marks)**

8 a. Discuss briefly any two color models used in color image processing. **(10 Marks)**

b. Explain intensity slicing and Graylevel to color transformation as applied to pseudocolor image processing. **(10 Marks)**

* * * * *