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## 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:
- Brightness adaptation
  - Weber ratio
  - 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:
- Neighbors of a pixel
  - Adjacency of pixels
  - Digital path
  - 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	2	3
	0	2	1
		1	0
	2	1	2
			1 (p)

Fig.Q3(b)

- c. For the  $2 \times 2$  transform 'A' and the image 'U', calculate the transformed image 'V' and basis images. (08 Marks)

$$A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}; \quad U = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

(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
- $$H_1 = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}. \text{ Also, indicate its sequency. (04 Marks)}$$

**PART – B**

- 5 a. With necessary graphs, explain the following spatial image enhancement operations:
- Image negative
  - Log transformation
  - Power law transformation
  - Contrast stretching

(12 Marks)

- b. Perform histogram equalization of the  $5 \times 5$  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)

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