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10EC763

Seventh Semester B.E. Degree Examination, Aug./Sept.2020

Image Processing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. Explain the fundamental steps involved in digital image processing with block diagram. (10 Marks)
- b. Explain the importance of brightness adaptation and discrimination in image processing. (05 Marks)
- c. Explain the image formation in the human eye. (05 Marks)
- 2 a. Explain image acquisition using single sensor. (06 Marks)
- b. Explain the relation between pixels using neighbours of a pixels. (06 Marks)
- c. Consider an image segment:

| | | | | |
|---|---|---|---|-----|
| 3 | 4 | 1 | 2 | 0 |
| 0 | 1 | 0 | 4 | ⓐ q |
| 2 | 2 | 3 | 1 | 4 |

p ⓑ 0 4 2 1

Let $v = \{0, 1, 2\}$, compute the length of the shortest 4, 8 and m-path between p and q. Repeat for $v = \{2, 3, 4\}$. (08 Marks)

- 3 a. State the properties of unitary transforms. (08 Marks)
- b. Explain separability property of 2D Fourier transform. (06 Marks)
- c. For the given orthogonal matrix A and image u, calculate the transform ϕ image v.

$$A = \frac{1}{2} \begin{pmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{pmatrix}, \quad u = \begin{pmatrix} 1 & 2 \\ 1 & 2 \end{pmatrix} \quad (06 \text{ Marks})$$

- 4 a. Give an expression for 2D forward and inverse discrete cosine transform and list its properties. (10 Marks)
- b. Find 4×4 Haar transform matrix H_4 . (10 Marks)

PART - B

- 5 a. Explain Gray level slicing and bit-plane slicing. (08 Marks)
- b. For the given 4×4 image having grey scales between [0 9], get histogram equalized image and draw the histogram of image before and after equalization.

| | | | |
|---|---|---|---|
| 2 | 3 | 3 | 2 |
| 4 | 2 | 4 | 3 |
| 3 | 2 | 3 | 5 |
| 2 | 4 | 2 | 4 |

(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. 42+8 = 50, will be treated as malpractice.

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- 6 a. Explain with a block diagram, the basic steps for image filtering in frequency domain. (10 Marks)
- b. What is homomorphic filtering? With block diagram, explain the homomorphic filtering approach for image enhancement. (10 Marks)
- 7 a. Explain the model of the image degradation and restoration model. (06 Marks)
- b. Explain Notch filter used in periodic noise reduction by frequency domain filtering. (08 Marks)
- c. Explain briefly inverse filtering approach. (06 Marks)
- 8 a. Discuss RGB color model by drawing schematic of the RGB color cube. (06 Marks)
- b. With functional block diagram, explain pseudocolor coding approach is used for several monochrome images. (08 Marks)
- c. Given $RGB = (0.683, 0.1608, 0.1922)$. Convert this to HSI model. (06 Marks)

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