



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:

$$\begin{array}{cccccc}
 3 & 4 & 1 & 2 & 0 & \\
 0 & 1 & 0 & 4 & \textcircled{2} & q \\
 2 & 2 & 3 & 1 & 4 & \\
 p & \textcircled{3} & 0 & 4 & 2 & 1
 \end{array}$$

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.

$$\begin{array}{cccc}
 2 & 3 & 3 & 2 \\
 4 & 2 & 4 & 3 \\
 3 & 2 & 3 & 5 \\
 2 & 4 & 2 & 4
 \end{array}$$

(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.

- 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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