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10EC763

Seventh Semester B.E. Degree Examination, July/August 2021
Image Processing

Time: 3 hrs.

Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. What is digital image processing? Explain the fundamental steps in digital image processing.

(10 Marks)

   b. Describe briefly the principle of image formation in human eye. (06 Marks)

   c. Explain brightness adaption, with the help of the related graph. (04 Marks)

2 a. Explain the process of image sampling and quantization in digital image processing.

(10 Marks)

   b. Describe the following terms applied to image processing :
      i)   Neighbours of a pixels
      ii) Adjacency of pixels
      iii) Distance measures. (06 Marks)

   c. Explain the process of image acquisition using single sensor. (04 Marks)

3 a. Define two-dimensional DFT. Explain any four properties of 2 – DFT. (10 Marks)

   b. For the 2×2 matrix A and the image U,

   $$A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \quad \text{and} \quad U = \begin{bmatrix} 1 & 2 \\ 8 & 4 \end{bmatrix}$$

   Calculate the transformed image V, the basis images and inverse transformation of the image.

(10 Marks)

4 a. Compute discrete cosine transform matrix for N = 4. (10 Marks)

   b. 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 sequence.

(06 Marks)

   c. List the properties of slant transform. (04 Marks)

5 a. Explain the following image enhancement techniques with their applications.
      i)   Image negatives
      ii) Power law transforms
      iii) Log transforms. (10 Marks)

   b. Perform the image histogram equalization for the image shown in Fig.Q5(b).

$$\begin{bmatrix} 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 & 3 \\ 3 & 3 & 3 & 3 & 3 \\ 0 & 0 & 0 & 7 & 7 \end{bmatrix}$$

Fig.Q5(b)

(10 Marks)

6 a. Explain with block diagram, homomorphic filters in image enhancement. (10 Marks)

b. Explain the smoothing of images in frequency domain using :
   i) Ideal low pass filters
   ii) Butterworth lowpass filters. (10 Marks)

7 a. Explain the importance of image restoration system in image processing. Explain any four important noise probability density functions. (10 Marks)

b. Explain in brief various mean filters and order statistics filters in image restoration system. (10 Marks)

8 a. Briefly explain RGB and HSI colour models with their conversions. (10 Marks)

b. Write a note on the following pseudo image processing techniques :
   i) Intensity slicing
   ii) Gray level to color transformations. (10 Marks)

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