USN | | | | | | | | | | | 15MT754

Seventh Semester B.E. Degree Examination, June/July 2019
Digital Image Processing

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. Define image processing. What are the applications of image processing and describe them in various fields. **(08 Marks)**
    b. With a neat block diagram explain the fundamental steps in image processing. **(08 Marks)**

OR

2   a. With a neat diagram describe the various components of image processing. **(08 Marks)**
    b. Explain the structure of Human eye and the principle of image formation in an human eye. **(08 Marks)**

Module-2

3   a. With necessary diagram explain the image acquisition using single sensor and sensor strips. **(08 Marks)**
    b. Explain the basic concept in sampling and quantization and the presentation of digital image. **(08 Marks)**

OR

4   a. Explain the neighbors of pixels and adjacency connectivity, regions and boundary. **(09 Marks)**
    b. Explain and derive the distance measure. **(05 Marks)**
    c. Define Resolution. **(02 Marks)**

Module-3

5   a. For the 2×2 transform A and the image U

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

Calculate the transformed image U, basis images and U. **(04 Marks)**
    b. Derive an expression of energy conservation, energy compaction and write equation of decorrelation. **(06 Marks)**
    c. Derive 2-D DFT and the 2-D circular convolution theorem. **(06 Marks)**

OR

6   a. Explain and derive the properties of Discrete cosine transform. **(08 Marks)**
    b. Derive Hadmard and its properties. **(08 Marks)**

Module-4

7 a. Perform the histogram equalization for

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

(08 Marks)

   b. Explain the enhancement using arithmetic and logic operations.　(08 Marks)

OR

8 a. Explain the mechanism of spatial filtering and the representation of 3×3 spatial mask.

(06 Marks)

   b. With the neat diagram explain the enhancement in the frequency domain.　(04 Marks)

   c. Explain Homomorphic filtering.　(06 Marks)

Module-5

9 a. Explain the following with respect to noise models:
      (i)   Rayleigh noise　　　　(ii) Erlang noise
      (iii) Uniform noise　　　　(iv) Exponential noise　(08 Marks)

   b. Explain briefly the inverse filtering.　(02 Marks)

   c. Explain minimum mean square error filter.　(06 Marks)

OR

10 a. Explain the R.G.B colour model.　(06 Marks)

    b. Derive the conversion of RGB to HSI and HSI to RGB.　(06 Marks)

    c. With the neat block diagram explain the pseudo color image processing.　(04 Marks)

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