17EC72

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Digital Image Processing

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. Explain seven important applications of Digital Image Processing based on the EM energy or frequency range used.   **(07 Marks)**

   b. Describe the fundamental steps in digital image processing with a block diagram.   **(07 Marks)**

   c. Define D_e, D_4 and D_8 distance between the pixels. Let $V = \{0, 1\}$. Compute D_e, D_4 and D_8 between the pixels p and q for the image segment, Fig.Q1(c). Row and column number starts from (0, 0).

$$\begin{array}{cccc} 3 & 1 & 2 & 1\,(q) \\ 2 & 2 & 0 & 2 \\ 1 & 2 & 1 & 1 \\ (p)\,1 & 0 & 1 & 2 \end{array}$$
Fig.Q1(c)   **(06 Marks)**

OR

2   a. Describe the various components of a general purpose image processing system with a block diagram.   **(07 Marks)**

   b. Explain the three methods of image acquisition using sensors.   **(07 Marks)**

   c. Determine the memory capacity required for storing a 1024×1024 monochrome image with 256 intensity levels. If each byte is transmitted with a start bit and a stop bit using a 56 K baud modem then how many minutes are required for transmitting this 1024×1024 size image? What is the time required for 3000 K baud DSL without a start and stop bit?

                                                                                          (06 Marks)

Module-2

3   a. Describe six basic intensity transformation functions with equations, examples and graphs, including piecewise linear transformation functions.   **(12 Marks)**

   b. Write the original histogram, transformation function and equalized histogram for the 3 bit, 64×64 size image whose information is given in below table.

r_K	$r_0 = 0$	$r_1 = 1$	$r_2 = 2$	$r_3 = 3$	$r_4 = 4$	$r_5 = 5$	$r_6 = 6$	$r_7 = 7$
n_K	790	1023	850	656	329	245	122	81

                                                                                          (08 Marks)

OR

4   a. Describe 2-D impulse, sifting property, 2-D continuous Fourier transform, 2-D sampling theorem and 2-D DFT with equations and examples with respect to digital image processing.

                                                                                          (12 Marks)

   b. Explain periodicity and symmetric properties of 2D – DFT with equations, diagrams and examples.   **(08 Marks)**

Module-3

5 a. Given a = 2 and b = 4, find the mean and variance for uniform noise and exponential noise models along with their PDFs, showing the maximum value. **(06 Marks)**

b. Explain four types of mean filters. **(08 Marks)**

c. Describe the three methods of estimation of degradation functions with equations and examples. **(06 Marks)**

OR

6 a. Given a = 2 and b = 4, find the mean and variance for Rayleigh and Gamma noise models along with their PDFs, showing the peak values. **(06 Marks)**

b. Explain four types of order statistics filters. **(08 Marks)**

c. Describe adaptive median filter with equations and examples. **(06 Marks)**

Module-4

7 a. Explain RGB color model with diagrams and color equivalent values in binary/HEX. How it can be converted to CMY and HSI models using suitable equations? **(12 Marks)**

b. Describe the two approaches for pseudo color image processing. **(08 Marks)**

OR

8 a. Explain any six basic morphological algorithms with equations and an example for each. **(12 Marks)**

b. Describe Erosion, Dilation, Opening and Closing operations with equations and an example for each. **(08 Marks)**

Module-5

9 a. Describe the Laplacian usage for the detection of isolated points with equations and an example. **(08 Marks)**

b. Explain edge detection principle using the image gradient and different types of masks or operators. **(08 Marks)**

c. Describe edge linking using local processing technique with an example. **(04 Marks)**

OR

10 a. Describe border following and chain code methods for boundary representation, with examples. **(08 Marks)**

b. Explain shape numbers and Fourier description used in image shape and boundary representation/description, with examples. **(08 Marks)**

c. Describe statistical moments used for the representation of boundary segments. **(04 Marks)**

* * * * *