

CBCS SCHEME

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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).

	3	1	2	1 (q)
	2	2	0	2
	1	2	1	1
(p)	1	0	1	2

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)
