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.

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.

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)**

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