CBCS SCHEME

USN | | | | | | | | | |

15EC72

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

Digital Image Processing

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions.

1 a. Explain the fundamental steps in digital image processing along with a block schematic. **(08 Marks)**

b. Define horizontal neighbors, vertical neighbors and diagonal neighbors for pixel p(x, y). Also determine the three distance measures between p(x, y) and q(s, t) in Fig.Q1(b), where coordinate starts with (0, 0) in this grayscale image.

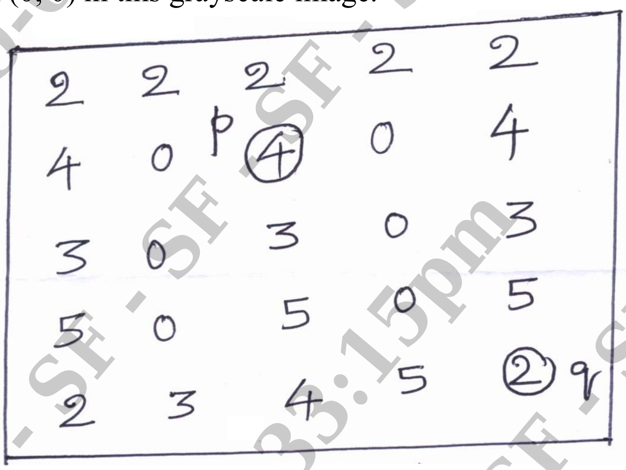

Fig.Q1(b) **(08 Marks)**

2 a. Explain image acquisition using single sensor, sensor strips and sensor arrays with relevant diagrams. **(09 Marks)**

b. Explain 4-adjacency, 8-adjacency and a region, linear and non-linear operators in image processing, for a 2-dimensional image with an example for each. **(07 Marks)**

3 a. Explain image negative, log transformation and power-law transformation with equations and figures. **(06 Marks)**

b. Explain historgram equalization for the given set of values in Table.Q3(b), determine the equalized histogram for a 3-bit image of size 64 × 64 pixels.

K	0	1	2	3	4	5	6	7
r_K	0	1	2	3	4	5	6	7
n_K	790	1023	850	656	329	245	122	81

Table.Q3(b) **(10 Marks)**

4 a. Explain the 7 steps used for filtering in the frequency domain. Define 2-D convolution theorem. **(06 Marks)**

b. Describe image sharpening using the following frequency domain filters:

(i) Ideal highpass filter
(ii) Butterworth highpass filter
(iii) Gaussian highpass filter **(10 Marks)**

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.

5 a. Explain Gaussian, Rayleigh and Erlang noise models with equations and graphs. **(06 Marks)**
b. Describe adaptive local noise reduction filter and adaptive median filter used for removing noise in images. **(10 Marks)**

6 a. Explain arithmetic mean, geometric mean and median filter with equations and their usage for noise removal in images. **(06 Marks)**
b. Describe bandreject, bandpass and notch filters used for reduction of periodic noise with equations and figures. **(10 Marks)**

7 a. Explain the RGB color model with a cube structure and color equivalent values. Write the equations to convert RGB to HIS and HIS to RGB for color components. **(10 Marks)**
b. Briefly explain the subband coding with a block diagram of a simple digital filter and impulse response for the input $f(n) = \delta(n)$. **(06 Marks)**

8 a. Explain erosion and dilation operations along with their duality equations and examples with images. **(08 Marks)**
b. Describe opening and closing operations along with their duality equations and examples with images. **(08 Marks)**

9 a. Explain how isolated points and lines can be detected in images using derivatives and Laplacian mask respectively. **(08 Marks)**
b. Describe Canny edge detection method with equations and figures. **(08 Marks)**

10 a. Explain boundary following and chain codes used for representation for describing regions. **(08 Marks)**
b. Describe the MPP algorithm and its illustration with an example of vertices. **(08 Marks)**

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