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10EC763

Seventh Semester B.E. Degree Examination, July/August 2022

Image Processing

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. With a neat block diagram, explain the fundamental steps in digital image processing. (10 Marks)
- b. Explain image formation in the human eye. (06 Marks)
- c. List four applications of image processing. (04 Marks)

- 2 a. With a suitable diagram, explain how an image is acquired using Single Sensor and Linear Sensor Strip. (08 Marks)
- b. Find D_4 , D_8 and D_m for the following 2D section with $V = \{1, 2\}$ between p and q.

5	4	3	1	1	(q)
5	4	0	2	0	
3	2	0	2	4	
2	1	1	3	5	
(p)	1	3	5	1	3

- c. Find the Euclidean, City-block and Chess board distances between the pixels p(3, 4) and q(2, 6). (06 Marks)

- 3 a. Consider the 2×2 transform A and the image U given below:

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

Calculate the transformed image V and the basis images. Check the transformed image V using the basis images and U. (10 Marks)

- b. Construct 4×4 DFT matrix and show it is unitary. (10 Marks)

- 4 a. Write H matrix and obtain Haar transform matrix for $N = 8$. (10 Marks)
- b. Determine 4×4 Slant transform matrix. List its properties. (10 Marks)

PART – B

- 5 a. Explain the following image enhancement techniques, highlighting the area of application.
 - (i) Intensity level slicing
 - (ii) Power-law transformation
 - (iii) Bit-plane slicing (10 Marks)
- b. For a given 4×4 image having gray levels between [0, 9]. Perform histogram equalization and draw the histogram of image before and after equalization.

2	3	3	2
4	2	4	3
3	2	3	5
2	4	2	4

(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.

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- 6 a. With the help of a block diagram, explain the homomorphic filtering approach for image enhancement. (10 Marks)
- b. Discuss various mean filters and order statistics filters in image restoration system. (10 Marks)
- 7 a. Explain the following noise models:
(i) Erlang Noise
(ii) Rayleigh Noise
(iii) Impulse (Salt and Pepper) Noise (06 Marks)
- b. Derive an expression of the linear degradation model in presence of additive noise. (08 Marks)
- c. Explain Weiner Filtering method of restoring images. (06 Marks)
- 8 a. Explain the RGB colour model and develop the procedure for converting RGB to HSI model. (10 Marks)
- b. Explain in detail Pseudo Colour Image Processing. (10 Marks)
