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18MT744

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. What is digital image processing and explain the use of DIP in any four application. (10 Marks)
b. Explain the fundamental steps involved in digital image processing with neat sketch. (10 Marks)

OR

- 2 a. With the necessary sketch explain the concept of brightness adaptation and discrimination. (10 Marks)
b. With a neat sketch, explain the components of an image processing system. (10 Marks)

Module-2

- 3 a. With a neat sketch, interpret the working of different image sensing and acquisition system used in a digital image processing. (10 Marks)
b. Consider an image segment:

$$\begin{matrix} 3 & 4 & 1 & 2 & 0 \\ 0 & 1 & 1 & 4 & 2 \text{ (q)} \\ 2 & 2 & 3 & 1 & 4 \\ \text{(p)} & 2 & 0 & 4 & 2 & 1 \end{matrix}$$

Calculate the shortest 4 path, 8 path and m path distance between the pixels p and q if $v = \{0, 1, 2\}$. (10 Marks)

OR

- 4 a. Explain the following relationship between pixels with a suitable examples: (12 Marks)
(i) Neighbors (ii) Adjacency (iii) Connectivity, region and boundary
b. Illustrate different distance measures with a help of neat sketch. Also calculate these distance between the pixels P(120, 50) and Q(90, 200) (08 Marks)

Module-3

- 5 a. Discuss the properties of 2 dimensional DFT. (10 Marks)
b. For the 2×2 orthogonal matrix A and image u obtain the transformed image and basis images and inverse transformation.

$$A = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \quad u = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad (10 \text{ Marks})$$

OR

- 6 a. Generate Haar basis for $N = 2$. (12 Marks)
b. Discuss the properties of discrete cosine transform. (08 Marks)

Module-4

- 7 a. With a neat sketch illustrate Piecewise –Linear transformation functions. (12 Marks)
 b. With the sketch, explain the contrast stretching and thresholding function. (08 Marks)

OR

- 8 a. A 64×64 , 3 bit image with the intensity distribution as shown in Table.Q8(a)(i). It is desired to transform this histogram so that it will have the values specified in Table.Q8(a)(ii). Sketch: (i) Transformation function of specified histogram (ii) Result of performing specified histogram.

rK	0	1	2	3	4	5	6	7
nK	790	1023	850	656	329	245	122	81

Table.Q8(a)(i)

zq	0	1	2	3	4	5	6	7
$p_z(zq)$	0.00	0.00	0.00	0.15	0.20	0.30	0.20	0.15

Table.Q8(a)(ii)

- b. Explain any two basic intensity transformation with neat sketch. (12 Marks)
 (08 Marks)

Module-5

- 9 a. Discuss the model of image degradation/restoration with neat sketch. (04 Marks)
 b. Explain different noise probability density functions with necessary equations and graphs. (16 Marks)

OR

- 10 a. Explain any two color models. (12 Marks)
 b. Discuss about pseudo color image processing and intensity slicing as applied to pseudo color image processing. (08 Marks)

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