CBCS SCHEME

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15EC72

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Digital Image Processing

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What is digital image? Explain the fundamental steps of digital image processing. **(08 Marks)**

b. Explain the concept of sampling and quantization of an image. **(06 Marks)**

c. Mention any four fields that use digital image processing. **(02 Marks)**

OR

2 a. Explain with neat diagram, how image is acquired using senstor strips? **(08 Marks)**

b. Define 4-, 8- and m-adjacency. Compute the lengths of the shortest 4-, 8- and m-path between p and q in the image segment shown in Fig. Q2 (b) by considering $V = \{2, 3, 4\}$ **(06 Marks)**

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

Fig. Q2 (b)

c. A common measure of transmission for digital data is the baud rate defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of a start bit, a byte (8 bits) of information and a stop bit. Using these facts find how many minutes would it take to transmit a 2048×2048 image with 256 intensity levels using a 33.6 K baud modem? **(02 Marks)**

Module-2

3 a. For a given 4×4 image having gray scales between [0, 9] perform histogram equalization and draw the histogram of image before and after equalization. 4×4 image is shown in Fig. Q3 (a). **(08 Marks)**

$$\begin{bmatrix} 2 & 3 & 3 & 2 \\ 4 & 2 & 4 & 3 \\ 3 & 2 & 3 & 5 \\ 2 & 4 & 2 & 4 \end{bmatrix}$$

Fig. Q3 (a)

b. Explain smoothing of images in frequency domain using ideal, Butterworth and Gaussian Low pass filter. **(08 Marks)**

OR

4 a. Define 2D DFT- with respect to 2D DFT of an image and state the following properties:
(i) Translation (ii) Rotation (iii) Periodicity (iv) Convolution theorem. **(05 Marks)**

b. With necessary graphs, explain the log and power law transformation used for spatial image enhancement. **(05 Marks)**

c. Explain image sharpening in spatial domain using second order Laplacian derivative. **(06 Marks)**

Module-3

5 a. With necessary equations and graph, explain any four noise probability density functions. (08 Marks)

b. Explain minimum mean square error filtering method of restoring images. (08 Marks)

OR

6 a. Explain how image degradation is estimated using,
(i) Observation (ii) Mathematical modeling. (08 Marks)

b. Explain the order statistics filters used for restoring images in the presence of noise. (08 Marks)

Module-4

7 a. Write the equations for converting colors from HSI to RGB. (06 Marks)

b. Write H matrix for Haar transform for N = 4 and explain how it is constructed. (04 Marks)

c. Explain the following morphological algorithms:
(i) Thinning (ii) Thickening. (06 Marks)

OR

8 a. What is Pseudo color image processing? Explain intensity slicing as applied to pseudo color image processing. (07 Marks)

b. Explain Erosion and Dilation operations used for morphological processing. (07 Marks)

c. Define wavelet function. (02 Marks)

Module-5

9 a. Explain Marr-Hildreth edge detector. (10 Marks)

b. Write short note on Boundary segments. (06 Marks)

OR

10 a. Explain the following boundary descriptors: (i) Shape numbers (ii) Fourier descriptors. (08 Marks)

b. Explain Global Thresholding using Otsu's method. (08 Marks)

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