CBCS SCHEME

USN | | | | | | | | | | **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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