CBCS SCHEME

USN | | | | | | | | | | |

18CS741

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
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. Define Digital Image with a neat block diagram, explain the fundamental steps of image processing. **(08 Marks)**

b. Explain the applications of Image processing. **(06 Marks)**

c. Let p, q be the two pixels with coordinates (100, 120) and (130, 160) respectively. Compute:
i) Euclidean distance
ii) Chess board distance
iii) Manthatten distance. **(06 Marks)**

OR

2 a. Explain the data structure for representing digital image. **(08 Marks)**

b. Differentiate between sampling and quantization. **(06 Marks)**

c. Find the shortest 4, 8 m-path between p and q consider v = {0, 1}

	3	1	2	1 q
	2	2	0	2
	1	2	1	1
p	1	0	1	1

(06 Marks)

Module-2

3 a. Explain basic gray level transformation techniques. **(08 Marks)**

b. Explain image smoothing spatial fitter and sharpening spatial filter. **(06 Marks)**

c. Apply logarithmic transformation on the input image by considering C = 1.

110	120	90
91	94	98
90	91	99

(06 Marks)

OR

4 a. Explain image enhancement using arithmetic and logic operations. **(08 Marks)**

b. Explain image enhancement using first and second order derivatives. **(06 Marks)**

c. Consider a gray scale image in matrix form. Let each element be a pixel of an image and values of the element represent intensities of the pixel. Perform Histogram equalization on the image and scale the intensity from 1 to 20.

3	2	4	5
7	7	8	2
3	1	2	3
5	4	6	7

(06 Marks)

Module-3

5 a. What is Sampling theorem? Explain sampling and Fourier transform of sampled function. **(10 Marks)**

b. State and explain properties of 2D Fourier transform function. **(10 Marks)**

OR

6 a. Explain the basic steps for filtering in the frequency domain. **(10 Marks)**

b. Explain Sharpening in the frequency domain using high pass filter. **(10 Marks)**

Module-4

7 a. What are the three basic objectives of canny edge detector? Explain canny edge detection algorithm. **(08 Marks)**

b. Explain point, edge and line detection techniques. **(06 Marks)**

c. Explain Mar-Hildreth edge detection algorithm in detail. **(06 Marks)**

OR

8 a. Optimal global thresholding can be achieved by Otsu's method. Justify the answer with an algorithm. **(08 Marks)**

b. Generate the Sobel and Prewitt masks for the matrix given below :

$G_x =$

−1	−2	−1
0	0	0
1	2	1

$G_y =$

−1	0	1
−2	0	2
−1	0	1

(06 Marks)

c. What is meant by edge linking? Explain edge linking using local processing. **(06 Marks)**

Module-5

9 a. Define Image Compression. Explain coding spatial and temporal redundancy. **(06 Marks)**

b. Using arithmetic coding, decode the message 0.572 given the coding model

Symbol	!	C	E
Probability	0.1	0.4	0.5

(08 Marks)

c. Explain Image, compression system with a neat diagram. **(06 Marks)**

OR

10 a. Explain Lempel-Ziv-Welch (LZW) coding with an example. **(06 Marks)**

b. The character a to h have the set of frequencies based on the first 8 Fibonacci numbers as follows :

a : 1 b : 1 c : 2 d : 3 e : 5 f : 8 g : 13 h : 21

A Huffman code is used to represent the characters. What is the sequence of characters corresponding to the following code **(08 Marks)**

110111100111010

c. Explain Run length coding with an example. **(06 Marks)**

* * * * *