RollNo. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E./B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR/MAY 2024

INFORMATIONTECHNOLOGY

IT5023&Fundamental of Digital Image Processing

(Regulation2019)

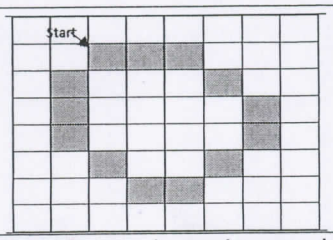
Time:3hrs **Max.Marks: 100**

On completion of the course, the students will be able to:

CO1 Implement basic image processing operations.
CO 2 Apply and develop new techniques in the areas of image enhancement and restoration.
CO 3 Understand the image segmentation algorithms.
CO 4 Extract features from images.
CO 5 Apply classifiers and clustering algorithms for image classification and clustering.
CO 6 Design and develop an image processing application that uses different concepts of image processing.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	Consider two pixels S and T with coordinates (8,9) and (1,3) respectively. Calculate the three types of distances between them.	2	1	3
2	Define intensity level resolution. What is the effect of increasing or decreasing intensity level resolution?	2	1	2
3	Write the steps in un-sharp masking filtering. What is the use of it?	2	2	1
4	Perform DFT and IDFT of the following 2D image 1 0 0 1	2	2	4
5	In DFT of an image, corrupted by sinusoidal noise of various frequencies, the components lie on an approximately circle about the origin. How can this noise be removed?	2	2	3
6	What is meant by wavelet transform in the context of image input?Give one example with its shape.	2	2	2
7	What is the meaning for gray level discontinuity in an image? List the types of it.	2	3	1
8	Find 8-direction chain code for following image. 	2	4	4
9	A classifier is designed to identify malignant tumor in an image data set and its performance is given in the following confusion matrix. Compute accuracy. Actual \ Predicted → / ↓ : Benign, Malignant Benign: 15, 4 Malignant: 3, 17	2	5	4
10	Name four uses of unsupervised learning algorithm in image dataset.	2	6	2

PART- B(5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q.No	Questions	Marks	CO	BL
11 (a) (i)	Perform convolution on the 5x5 image using 3x3 mask S. Use zero padding. 0 0 0 0 1 0 0 0 1 1 0 0 1 1 1 0 1 0 0 1 1 1 1 1 1 S: 0 1 0 / 1 1 1 / 0 1 0	7	1	3
(ii)	Define the two processes involved in converting an image into digital form and explain them.	6	1	2
OR				
11 (b)(i)	Consider the image segment given below. For V = {0,1}, compute the shortest 4-path, 8-path and m-path between p and q. If a particular path does not exist, explain why. 3 1 2 1 (q) 2 2 0 2 1 2 1 1 (p) 1 0 1 2	7	1	3
(ii)	Explain different file formats of Digital image.	6	1	2
12 (a) (i)	Compute histogram of the given 3-bit gray scale image and perform histogram equalization for the same image. 3 4 7 3 0 1 1 2 0 4 1 4 2 0 1 6 6 1 1 0 3 2 2 0 6 2 1 1 3 0 1 2 3 0 7 1	10	2	4
(ii)	What is meant by gray level transformation? Give one example and write its use.	3	2	2
	OR			
12 (b) (i)	Apply spatial domain 3x3 averaging filter on image f(x,y) and obtain g(x,y). Also perform spatial domain Laplacian filtering on f(x,y) and obtain L(x,y). Use border padding. f(x,y)= 200 215 212 208 198 5 202 199 199 207 202 1 203 218 210 2	10	2	4
(ii)	Write down the step in performing filtering in frequency domain.	3	2	2

13 (a)(i)	What is the need for multiresolution analysis? Explain pyramidal coding technique for representing multiresolution information efficiently.	6	2	3
(ii)	Decompose the given image into different frequency bands usingsub band coding. Use simple averaging as low pass filter and simple differencing as high pass filter. 121 122 113 99 100 96 89 81 80 79 75 73 74 76 75 76	7	2	4
	OR			
13 (b)(i)	Explain Gaussian & Rayleigh noise models and geometric mean noise removal scheme.	6	2	3
(ii)	Identify the noise in the given image. Apply the appropriate filtering technique to remove the noise. Use border padding. 126 128 128 255 126 127 0 132 128 128 130 127 0 128 127 128 255 128 255 128 125 131 126 128 0	7	2	4
14 (a)(i)	What is meant by edge linking? Explain local edge linking method.	6	4	2
(ii)	Explain Canny edge detection method with an example.	7	3	2
	OR			
14 (b) (i)	What is use of Scale Invariant Feature Transform (SIFT) algorithm? Explain how scale invariant is achieved in SIFT algorithm.	6	4	2
(ii)	Explain how an efficient optimal thresholding can be obtained using Otsu's method.	7	3	2
15 (a) (i)	Define Precision, Recall and F1 score.	3	5	2
(ii)	Explain Support Vector Machine classification algorithm with an example.	10	5	3
	OR			
15 (b) (i)	Distinguish supervised and unsupervised learning algorithms.	3	5	2
(ii)	Explain simple linkage and complete linkage agglomerative clustering algorithm with example.	10	5	3

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16. (i)	Explain region growing segmentation algorithm. Apply the same on the following image matrix and show the segmented regions. Choose the shaded pixels as seed pixels and use this equation **|g(seedi) – g(pixel)| < T** for T=1.	9	3	5
(ii)	A visual platform (like Pinterest) at its core needs to understand and act on images. The users can bookmark images to create folders which act as make-shift blogs. Also they can search interested images using key words or key image. To enhance their performance and make it more user friendly, they want to apply machine learning algorithms. Identify which algorithms and explain how they can be used.	6	6	6

9	9	9	9	8	8	7
9	9	9	9	8	8	7
8	8	8	8	8	8	7
7	7	7	7	7	7	7
7	7	5	5	5	5	5
7	7	7	7	5	5	5
7	7	7	7	5	5	5