Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth Semester B.Tech Degree Regular Examination June 2023 (2019 Scheme)

Course Code: CST438
Course Name: IMAGE PROCESSING TECHNIQUE

Max. Marks: 100   **Duration: 3 Hours**

PART A
Answer all questions, each carries 3 marks.   Marks

1	Define the following terms with respect to image processing?	(3)
	(i) Gray Level	
	(ii) Hue and Saturation	
2	Differentiate Photopic and Scotopic Vision.	(3)
3	List out the properties of 2D Fourier Transform.	(3)
4	Compute the DFT of the sequence f(x) = {1 0 0 1}	(3)
5	What are the steps in Filtering of images in frequency domain?	(3)
6	Explain the process of Unsharp masking.	(3)
7	List the different Mean filters available for removing noise from images.	(3)
8	What is segmentation and list any two approaches to segmentation of images.	(3)
9	Differentiate between Dilation and Erosion.	(3)
10	Explain Chain Codes and its use in image processing.	(3)

PART B
Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	What is Image Interpolation? Explain any two interpolation techniques.	(8)
	b)	Explain a simple image formation model with a neat sketch.	(6)

OR

12	a)	Explain Brightness Adaptation and Brightness Discrimination. What is the significance of Webber Ratio.	(8)
	b)	Explain any two Color Models along with the application of each.	(6)

Module II

13	a)	Explain the 2D Discrete Cosine Transforms with its Functions and Give the basic operations of the DCT.	(8)
	b)	Verify whether the DFT matrix is unitary or not for N=4.	(6)

OR

14 a) Compute 2D DCT of f(x,y) = $\begin{pmatrix} 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \end{pmatrix}$ (8)

b) Explain the Hadamard Transform with the necessary equations and matrices as needed. (6)

Module III

15 a) Illustrate the process of enhancing an image using a standard Spatial averaging filter of size 3x3. Use the sample image matrix given below. (5)

$I = \begin{pmatrix} 1 & 2 & 1 & 2 \\ 1 & 2 & 12 & 2 \\ 3 & 2 & 1 & 2 \\ 3 & 3 & 2 & 1 \end{pmatrix}$

What are the effects of border/ side pixels during the process of filtering and how can they be overcome. (3)

b) What is Bit Plane Slicing. Demonstrate considering the image intensity values given below. Assume that each pixel takes 4 bits for its representation. (6)

$B = \begin{pmatrix} 4 & 3 & 3 & 6 \\ 3 & 3 & 6 & 4 \\ 3 & 6 & 4 & 4 \\ 6 & 4 & 4 & 4 \end{pmatrix}$

OR

16 a) Explain the filters available for smoothing of images in frequency domain. (9)

b) Illustrate the process of spatial convolution using the values given below. (5)

I = [1 , 2 , 4 , 1]   h = [1 2 1]

Where I is the image sequence and h is the mask.

Module IV

17 a) Filter the image given below using $N_4(p)$, 3x3 MIN and MAX Filter masks. (8)

$I = \begin{pmatrix} 10 & 11 & 11 & 12 \\ 13 & 13 & 24 & 13 \\ 13 & 3 & 12 & 13 \\ 3 & 10 & 12 & 10 \end{pmatrix}$

b) Explain region Splitting and Merging Technique for image Segmentation. (6)

OR

18 a) Explain any three Image Noise models with necessary plots and equations. (9)

b) Write the steps in the Otsu's method of global thresholding , giving the necessary equations. (5)

Module V

19 a) Give the importance of hit or miss transformation in morphological image processing. Find the hit or miss transformation for the sample input image given in fig (i) when processed with the structuring element given in fig (ii). (8)
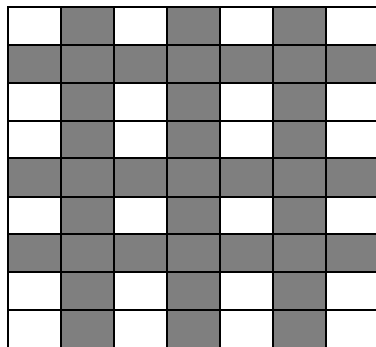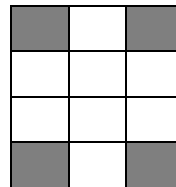

fig (i) Input image matrix   fig (ii) Structuring Element

b) Define the following morphological operations and give their use in image processing. (6)

    (i)   Opening (ii) Closing

OR

20 a) Define any four regional descriptors for describing the boundary of an object. (8)

b) Explain the Polygon approximation approach using minimum perimeter polygon method. (6)

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