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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth Semester B.Tech Degree Supplementary Examination August 2024 (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	What is Mach bands effect?	(3)
2	Differentiate between a binary image and a grayscale image.	(3)
3	Write any two properties of unitary transforms.	(3)
4	Write the recursive definition of a Hadamard Transform. Using this definition construct a 4 x 4 Hadamard matrix.	(3)
5	Differentiate between point operations and neighbourhood processing operations in image enhancement	(3)
6	Differentiate between Ideal low pass filter and Butterworth low pass filter.	(3)
7	Differentiate between image restoration and image enhancement techniques.	(3)
8	What are the different types of edge models in image processing? Illustrate their corresponding intensity profiles.	(3)
9	Describe the opening and closing operations in image processing.	(3)
10	Write about any three boundary descriptors in image processing.	(3)

PART B

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

Module I

11	a)	What is meant by image interpolation? Explain about any three interpolation techniques.	(7)
	b)	Explain about RGB and HSI color models.	(7)

OR

12	a)	What is meant by image registration? Explain how image registration is performed in digital images	(8)
	b)	Describe any three file formats for digital images.	(6)

Module II

13 a) List and explain any three properties of Fourier transforms. (6)

b) Derive the 4 order(N=4) DFT transform coefficients of an image $x(m, n)$. (8)

OR

14 a) Define DCT of an image. Verify whether the DCT matrix is unitary or not for N=2 (7)

b) Compute the 2D Discrete Cosine Transform (DCT) of the given 4x4 image matrix and explain the significance of DCT in image compression. (7)

$$\begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Module III

15 a) What is bit plane slicing? What is its significance in image processing? Explain with an example. (8)

b) Consider the following image segment. (6)

$$\begin{bmatrix} 0 & 15 & 7 & 2 \\ 3 & 4 & 1 & 3 \\ 1 & 5 & 2 & 1 \\ 2 & 3 & 7 & 7 \end{bmatrix}$$

Assume that the index of image matrix starts from **(0,0)**. Explain the method of calculation of new pixel value at image position **(1,1)** by applying the following smoothing filters of size 3×3

(i) Averaging filter

(ii)weighted Averaging filter

(iii)Median filter

(iv)Min filter

OR

16 a) What is the significance of unsharp masking? Perform unsharp masking in the following image using standard averaging filter of size 3×3. Apply zero padding before filtering (7)

$$\begin{bmatrix} 50 & 60 & 90 \\ 50 & 60 & 90 \\ 50 & 60 & 90 \end{bmatrix}$$

b) Explain the following image enhancement techniques in Frequency domain (7)

i) Gaussian High pass filter

ii) Butterworth high pass filter

Module IV

17 a) Define the process of image restoration. Explain any 4 important noise probability functions. (6)

b) Write the steps in the Otsu's method of global thresholding, giving the necessary equations. (8)

OR

18 a) What is meant by adaptive filtering? Explain the algorithm used to implement Adaptive median filter. (8)

b) Explain the region growing approach for image segmentation? What are the issues in implementing this approach? (6)

Module V

19 a) Define erosion and dilation. (7)

Consider the following image

0	0	0	0	0
0	1	1	1	0
0	1	1	1	0
0	1	1	1	0
0	0	0	0	0

Find the result of applying dilation and erosion on the above image using the kernel given below;

0	1	0
1	1	1
0	1	0

b) Explain about hit or miss transformation. Write any one application. (7)

OR

20 a) Explain about Moore boundary tracking (boundary-following) algorithm for boundary representation. (8)

b) Explain about various regional descriptors in image processing. (6)

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