Roll No. | | | | | | | | | | |

ANNA UNIVERSITY :: CHENNAI

B.E (FT) END SEMESTER EXAMINATIONS – NOV/DEC 2023

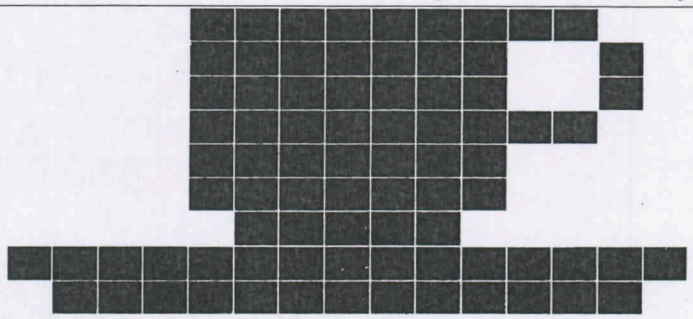
Computer Science and Engineering

Seventh Semester

CS6018 IMAGE PROCESSING

(Regulation 2018 - RUSA)

Time: 3 Hours | Max. Marks: 100

	Answer All Questions **PART - A (10 x 2 = 20 Marks)**	**CO**	**BL**
1.	State the role of sampling and quantization in image processing.	2	1
2.	Differentiate between 8-connectivity and m-connectivity.	2	2
3.	 Draw the histogram of the above image.	4	3
4.	Distinguish between image enhancement and image restoration. Give an example for each.	3	2
5.	Explain how gradient information is utilized in edge detection algorithms for detecting discontinuities.	3	2
6.	Explain why multiresolution analysis is useful in handling images with varying levels of detail.	3	2
7.	Calculate the entropy in bits for the following: Pixel values in an image whose possible grey values are all the integers from 0 to 255 with uniform probability.	3	3
8.	Calculate the run length coding of the following string: AAAABBBBBBBBCADDDDEEFFFFFFFF	3	3
9.	In a manufacturing setting where visual inspection is used for quality control, how could Bayesian classification be applied to automatically classify images of manufactured products as either defective or non-defective?	4	2
10.	Differentiate between steganography and digital watermarking.	4	2

PART – B (8 x 8 = 64 Marks)

(Answer any 8 questions)

11.	Analyze how the CMY color model is related to the RGB color model in terms of color representation. Also, explain the components of the HSI color model, and describe how it contribute to the overall perception of color.	**2**	**3**
12.	Analyze how the Euclidean distance reflects the "straight-line" distance between the pixels (10, 8) and (16, 25) in an image. Compare and contrast the City-block distance with the Euclidean distance.	**2**	**3**

13.	Write the algorithm for computing median of an n x n neighbourhood. What is the value of middle pixel after applying a (i) 3 x 3 median filter and (ii) 3 x 3 box filter? $\begin{bmatrix} 1 & 0 & 8 \\ 4 & 4 & 9 \\ 1 & 0 & 0 \end{bmatrix}$	3	**3**
14.	Analyze the different ways to estimate the degradation function in image restoration.	3	3
15.	Distinguish between smoothing and sharpening filters.	2	**3**
16.	Describe how the Laplacian pyramid is generated from a Gaussian pyramid and its significance.	3	**3**
17.	Obtain the Huffman code for the word 'IMAGEPROCESSING' and determine its efficiency.	3	**3**
18.	In the context of a facial recognition system, explain how Principal Component Analysis can be employed to extract essential facial features and reduce the computational complexity of the recognition process. Discuss the potential challenges and benefits.	4	4
19.	Analyze the challenges associated with segmenting images containing complex textures or overlapping objects with example. Explain how to overcome these challenges with example.	4	4
20.	Imagine you are working on a project to classify medical images as either "healthy" or "diseased." How would you preprocess the medical images, choose relevant features, and optimize an SVM model for accurate binary classification?	4	5
21.	Consider the situation where new images are continuously added to a database, how would you adapt the hierarchical clustering algorithm to efficiently update the hierarchy and incorporate new images without reprocessing the entire dataset?	4	5
22.	Considering the widespread use of social media platforms, how could image steganography be employed to share sensitive information or messages privately within images shared on these platforms?	4	4

PART – C (2 x 8 = 16 marks)

23.	A 4*X*4 image patch (4 bits/pixel) is given by I = $\begin{bmatrix} 12 & 9 & 12 & 10 \\ 12 & 14 & 8 & 10 \\ 9 & 13 & 12 & 10 \\ 12 & 14 & 12 & 10 \end{bmatrix}$. Apply histogram equalization to the image by rounding the resulting image pixels to integers. Sketch the histograms of the original image and histogram equalized image.	3	3
24.	In medical imaging, particularly in X-rays or MRI scans, how would you use thresholding techniques to segment and isolate specific structures or abnormalities in the images, such as tumors or bones?	3	4
