



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech V SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024

Regulation: UG20

IMAGE PROCESSING AND ANALYSIS

Time: 3 Hours

(CSE (DATA SCIENCE))

Max Marks: 70

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

## MODULE – I

- (a) Discuss in detail about various arithmetic operations with formula to manipulate pixel value in image. [BL: Understand| CO: 1|Marks: 7]
- (b) Consider the two image subsets, shown in the Figure 1. For  $V=1$ , determine whether these two subsets are i) 4-adjacent, ii) 8-adjacent, iii) m-adjacent. [BL: Apply| CO: 1|Marks: 7]

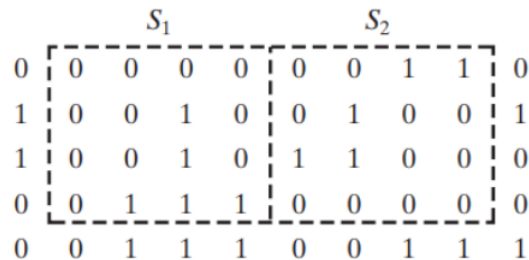


Figure 1

## MODULE – II

- (a) Explain about image smoothing and sharpening. Compare constrained and un constrained restoration models. [BL: Understand| CO: 2|Marks: 7]
- (b) Perform histogram equalization of the image shown in Figure 2 [BL: Apply| CO: 2|Marks: 7]

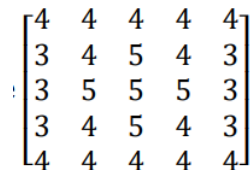


Figure 2

## MODULE – III

- (a) Explain in detail about edge linking and boundary detection. [BL: Understand| CO: 3|Marks: 7]

- (b) Obtain an expression based on reconstruction by dilation capable of extracting all the holes in a binary image. [BL: Understand| CO: 3|Marks: 7]
4. (a) Describe in detail about binary and gray level morphology operations. [BL: Understand| CO: 4|Marks: 7]
- (b) Identify the scenarios in which you would choose to use opening over closing, and vice versa, for image processing tasks [BL: Understand| CO: 4|Marks: 7]

#### MODULE – IV

5. (a) Illustrate the condition to be met by the partitions in region-based segmentation. Compare region based segmentation with edge-based segmentation. [BL: Understand| CO: 5|Marks: 7]
- (b) Examine how active contour models can be integrated into clinical workflows for applications such as tumor detection or organ segmentation. What are the potential benefits and limitations in a clinical setting? [BL: Apply| CO: 5|Marks: 7].
6. (a) Discuss in detail about feature extraction and representation [BL: Understand| CO: 5|Marks: 7]
- (b) Identify the scenarios in which might SIFT struggle to provide accurate feature matching, and how could these challenges be mitigated? [BL: Apply| CO: 5|Marks: 7]

#### MODULE – V

7. (a) Summarize the following :
- i) Image visualization methods
- ii) Slicing and data sets of 3D image visualization. [BL: Understand| CO: 6|Marks: 7]
- (b) Analyze the computational complexity of elastic deformation-based registration. How does the efficiency of this method compare to other registration techniques, especially in large-scale datasets? [BL: Apply| CO: 6|Marks: 7]
8. (a) Compare and contrast principal axis registration and interactive principal axis registration. [BL: Understand| CO: 6|Marks: 7]
- (b) Suppose you are tasked to design a virtual reality simulation for training purposes. How would you apply interactive visualization to simulate real-world scenarios, ensuring effective skill transfer? [BL: Apply| CO: 6|Marks: 7]

