Nirma University

Institute of Technology

Semester End Examination (IR), December - 2023

B. Tech. in ME / EC / CSE, Semester-VII

2ICOE03-O Pattern Recognition and Image Analysis

Roll No. [ ] Supervisor's initial with date: [ ]

Time: 3 hours Max. Marks: 100

Instructions:
1. **Attempt all questions.**
2. **Figures to right indicate full marks.**
3. **Use section-wise separate answer book.**
4. **Draw neat sketches wherever necessary.**
5. **Assume suitable data wherever necessary and clearly indicate it.**

SECTION –I

Q:1 **Answer the following.** **[18]**

[A] CO1,L4 Discuss the working of connected component labelling algorithm. Use the connected component labelling algorithm for providing the labels to the connected objects in the image shown in Fig.1. **[10]**

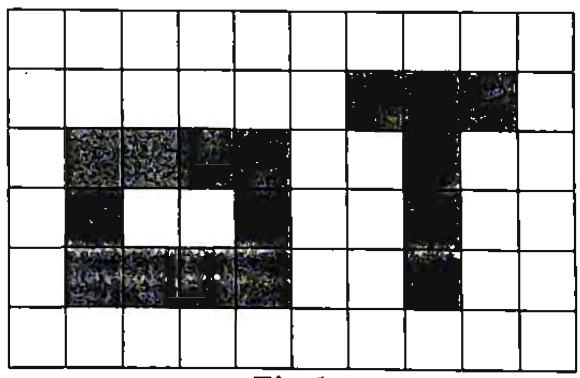

Fig.1

[B] CO1,L4 Discuss the working of morphological thinning operation. Apply the morphological thinning operation on the object shown in Fig.2. **[08]**

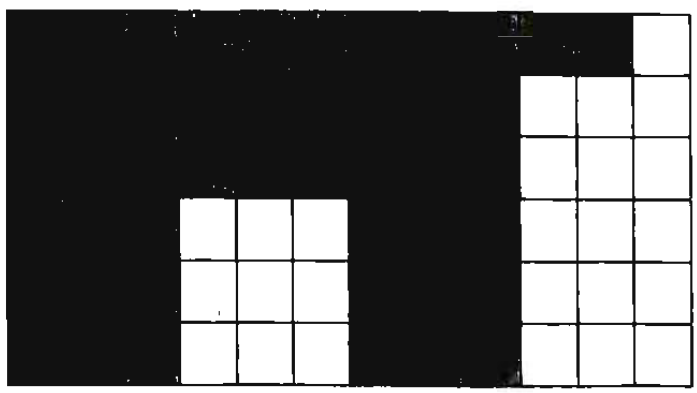

Fig.2

Q:2 **Answer the following.** **[16]**

[A] CO1,L3 Discuss the object skeletonization algorithm by using morphological operations in detail with suitable example. **[08]**

OR

[A] CO1,L3 Discuss discontinuity based image segmentation approaches for Edge detection. **[08]**

[B] CO1,L3 What do you mean by convex hull? Consider a non-convex object in any image and discuss the method for obtaining the convex hull for that object. **[08]**

OR

[B] CO1,L3 Discuss the applications of Morphological techniques for Boundary extraction with suitable example. **[08]**

Q:3 **Answer the following.** **[16]**

[A] CO2,L3 Discuss following boundary based descriptors with suitable applications: **[12]**

1) Fourier descriptor
2) Boundary straightness
3) Bending Energy

[B] CO2,L3 Discuss the application of Polygonal approximation method by splitting the boundary with suitable example. **[04]**

SECTION –II

Q:4 **Answer the following.** **[18]**

[A] CO3,L3 Discuss the working of Decision Trees algorithm with suitable example. **[08]**

[B] CO3,L3 Discuss the application of K-means clustering algorithm with suitable example. **[10]**

Q:5 **Answer the following.** **[18]**

[A] CO3,L3 Discuss the implementation of XNOR Gate using Neural Networks. Also, discuss the implementation of AND and OR Gate using Single Layer Perceptron. **[10]**

[B] CO3,L3 What is confusion matrix? Assume that we have a binary classification problem. We have some samples belonging to two classes: YES or NO. Also, we have our own classifier which predicts a class for a given input sample. On testing our model on 180 samples, we get the confusion matrix shown below. Calculate accuracy, recall, precision, F1 score, True positive rate and False positive rate. **[08]**

	Predicted: NO	Predicted: YES
Actual: NO	55	15
Actual: YES	10	100

OR

[B] CO3,L3 Discuss the working of Support Vector Machine Algorithm with necessary mathematical equations. **[08]**

Q:6 **Answer the following.** **[14]**

[A] CO3,L3 Discuss the role of Pooling layer and Flattening layer in Convolutional Neural Network with suitable example. Discuss the tuning of Hyper Parameters for Convolution Neural Network. **[14]**