

Roll No.

Total Pages : 4

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BT-6/M-24

COMPUTER VISION

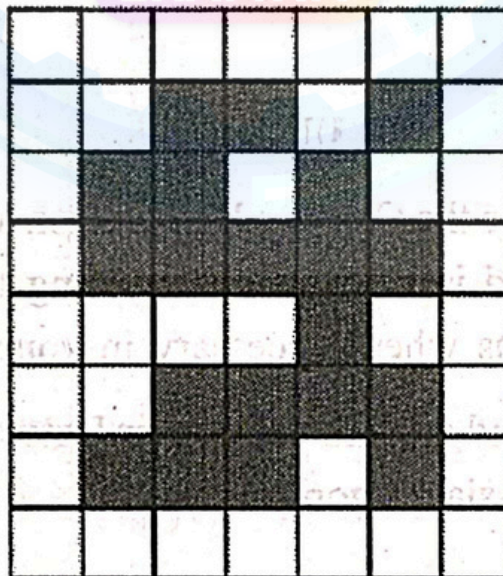
Paper : PC-CS-AIML-310A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) State the different limitations of a pinhole camera and how to overcome these limitations. Write a short note on thin lenses. (7)
- (b) Given below is a binary image where dark pixels denote object pixels. (2+3+3=8)



Binary Image

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[P.T.O.]

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- (i) Use 4-connectedness and 8-connectedness to sketch the distinct objects in the binary image.
- (ii) Write down the expression for the first order moments of a binary image. Use these expressions to compute the centroid of the object in the binary image given above. You may assume that the top left pixel has coordinates (0, 0).
- (iii) Write down the expressions for the second order moments of a binary image.
2. (a) Explain the different components of a vision system. How is conversion from affine to Euclidean images performed? (7)
- (b) What is Computer Vision? Why is vision so difficult? Provide six real-world examples of computer vision and explain. (8)

UNIT-II

3. (a) Describe the Canny edge detector. What are the steps involved in edge detection using this detector. Use diagrams where necessary in your explanation. (7)
- (b) Write and explain the Corner Detector and Laplacian of Gaussian algorithm. (8)

4. (a) Explain how the Fourier Transform is used for image enhancement by applying frequency domain filters, such as high-pass filtering, high-boost filtering, and homomorphic filtering. What is (are) the main task(s) for the above 3 filters as far as image processing is concerned? (7)
- (b) Explain Hough Transform with Example. Why is the need Morphological in Computer Vision? Justify with a Neat Diagram. (8)

UNIT-III

5. (a) What is meant by a pose? How can you hypothesize a correspondence between a collection of image features and a collection of object features, using pose consistency? (7)
- (b) Write short notes : (2+2+2+2= 8)
- (i) CVIP Tool.
 - (ii) Data Preprocessing.
 - (iii) Feature Analysis.
 - (iv) Feature Vectors.
6. (a) What are similarity measures? State any 3 examples for distance functions that can be used as similarity measures. (7)
- (b) What are proximity measures? State two properties of a dissimilarity measure. Mention any *two* examples for dissimilarity measures, with equations. (8)

UNIT-IV

7. (a) State the K-Means algorithm for clustering. Apply K-Means algorithm on the following data set to obtain two clusters : (1, 1), (1.5, 2), (3, 4), (5, 7), (3.5, 5), (4.5, 5) and (3.5, 4.5). (7)
- (b) What is BRDF? How are areas sources different from line sources? Explain Minimum Squared Error Method (MSE) for Classification. (8)
8. (a) What do you mean by dimensionality reduction and explain its importance in machine learning? Discuss the difference between linear and non-linear dimensionality reduction techniques. (7)
- (b) Explain Principal Component Analysis (PCA) and its objectives. How does Linear Discriminant Analysis (LDA) differ from PCA? (8)

EXAMKIT