BACHELOR OF TECHNOLOGY (CBCS) (2020 COURSE)
B.Tech.Sem - VIII COMPUTER SCIENCE & ENGINEERING : WINTER : 2024
SUBJECT: PATTERN RECOGNITION

Day : Monday
Date : 25/11/2024

W-24355-2024

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B :

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagrams **WHEREVER** necessary.
4) Use of non programmable **CALCULATOR** is allowed.
5) Assume suitable data if necessary.

Q.1 List the fundamental steps involved in digital image processing. Explain the challenges associated with sampling and quantization in the context of digital video processing. How can these challenges be addressed to achieve efficient processing? **(10)**

OR

Q.1 Explain the concept of histogram equalization. How does histogram equalization improve the contrast of an image? Provide a step-by-step explanation with the help of an example. **(10)**

Q.2 What is Mean, Median, Mode, Max, Min filters? Differentiate between linear and nonlinear spatial filers. Provide examples of each type. **(10)**

OR

Q.2 Compare and contrast spatial domain filtering with frequency domain filtering. Provide examples of applications where spatial domain filtering and frequency domain filtering is advantageous. **(10)**

Q.3 Define and differentiate between Clustering vs. Classification and Supervised vs. Unsupervised in the context of pattern recognition. **(10)**

OR

Q.3 Explain decision region, Metric spaces, and distances and object detection in context of pattern recognition. **(10)**

Q.4 Differentiate between stationary and nonstationary processes in the context of pattern recognition. Consider a time series dataset collected from a sensor monitoring temperature fluctuations over a year. Discuss whether this dataset can be considered as stationary or nonstationary. Justify you answer. **(10)**

OR

Q.4 Define the concepts of inner product and outer product in the context of linear algebra. Explain how these operations are used in pattern recognition. Consider a scenario where you have two vectors representing patterns: $X=[x_1, x_2, x_3]^T$ and $Y=[y_1, y_2, y_3]^T$ **(10)**

i) Compute the inner product (X, Y) and interpret its meaning.
ii) Compute the outer product XY^T.

P.T.O.

Q.5 What is clustering in pattern recognition? Explain different clustering algorithms commonly used in pattern recognition. **(10)**

OR

Q.5 Define DBSCAN (Density-Based Spatial Clustering of Applications with Noise) and explain its primary objective in pattern recognition. Compare and contrast K-means with density-based clustering. **(10)**

Q.6 Explain the concept of linear discriminant functions in pattern recognition. How are linear discriminant functions used to classify patterns? **(10)**

OR

Q.6 Explain the concept of support vector machines (SVM) in pattern recognition. Discuss the mathematical formulation of SVM and how it is used for pattern recognition tasks. **(10)**

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