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

Day : Wednesday
Date : 29/05/2024

S-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 Explain the fundamental steps involved in digital image processing. Discuss the significance of each step. **(10)**

OR

Q.1 Define image quantization and discuss the difference between spatial quantization and intensity quantization. How are these techniques applied in image compression? **(10)**

Q.2 What is Median, Mode filters? Explore the concept of image noise reduction using spatial median filtering. How does median filtering differ from mean filtering? Provide practical examples. **(10)**

OR

Q.2 What is low-pass and high pass filter? Explain in detail image enhancement by frequency domain methods. **(10)**

Q.3 Define pattern recognition. Explain the importance of decision boundaries and feature selection in pattern recognition. **(10)**

OR

Q.3 Explain supervised and unsupervised learning techniques in the context of pattern recognition. Provide examples of each. **(10)**

Q.4 Define Bayes Decision Theory and Describe its components including prior probabilities, likelihood functions, and posterior probabilities with mathematical formulations for each component. Discuss how Bayes' rule is applied in the context of pattern classification. **(10)**

OR

Q.4 Define eigenvalues and eigenvectors. Explain their significance in the context of pattern recognition. Find Eigenvalues and Eigenvectors for following matrix A. **(10)**

$$A=\begin{bmatrix}3 & 1\\ 1 & 2\end{bmatrix}.$$

P.T.O.

Q.5 Define DBSCAN (Density-Based Spatial Clustering of Applications with Noise) and explain its primary objective in pattern recognition. Discuss how DBSCAN differs form traditional clustering algorithms like K-means. (10)

OR

Q.5 Explain the concept of clustering in pattern recognition. How does clustering relate to unsupervised learning? Describe in detail the K-means algorithm.

Q.6 Describe the different variants of Gradient Descent algorithms commonly used in pattern recognition. Discuss the advantages and disadvantages of each variant. (10)

OR

Q.6 Define perceptron in pattern classification. Consider a dataset with two classes. when each class is described by two features x_1 and x_2. Use the perceptron learning algorithm to find the optimal decision boundary separating these two classes. Show the step-by-step process, including the initialization, weight updates and convergence criteria. (10)

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