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**Presidency University**

**Bengaluru**

**School Of Computer Science and Engineering & Information Science**

**SUMMER TERM End-Term Examinations, Aug 2024**

**Date**: 05-08-2024

**Time**: 09.30am to 12.30pm

**Max Marks**: 100

**Weightage**: 50%

**Odd Semester**: 2023 - 24

**Course Code**: CSE3122

**Course Name**: Pattern Recognition

**Department:** SOCSE

**Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Do not write any matter on the question paper other than roll number.*

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| **Q.No** | **Questions** | **Marks** | **CO** | **RBT** |
| 1 | 1. With an example discuss MST for recognizing the patterns. | 4 | CO1 | L1 |
| 1. Explain with examples of real-world applications where specialized datasets have significantly improved pattern recognition accuracy. | 6 | CO1 | L2 |
| 1. Describe the process of finding minimum risk estimators using Bayes' decision theory. | 10 | CO1 | L3 |
| OR | | | | |
| 2 | 1. Write short notes on a single representative per class. | 4 | CO1 | L1 |
| 1. Classify the main paradigms used in pattern recognition, and how do they differ in their approach to identifying patterns. | 6 | CO1 | L2 |
| 1. Write a function that computes the values Gaussian distribution N(m.s) at a given vector x. Hence plot the effect of varying mean and variance to the normal distribution. | 10 | CO1 | L3 |

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| 3 | 1. List and describe any 3 properties of distance measures with its example. | 4 | CO2 | L1 |
| 1. Discuss in detail about Fisher’s linear Discriminant method which is used in feature extraction to detect and isolate various features of patterns. | 6 | CO2 | L2 |
| 1. In fingerprint recognition, how can minutiae points be effectively extracted as an abstract representation for matching purposes? | 10 | CO2 | L3 |

OR

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| 4 | 1. Provide the polynomial kernel function used to calculate the distance between two patterns ( x ) and ( y ) and justify with an example. | 4 | CO2 | L1 |
| 1. Define the normalization of data sets and perform the normalization for the given datasets with its features below: **X1: (2, 120)** **X2: (8, 533)** **X3: (1, 987)** **X4: (15, 1121)** **X5: (18, 1023)** | 6 | CO2 | L2 |
| 1. Explain the different types of similarity and dissimilarity measures which are used to calculate the distance between different patterns with its respective mathematical representation. | 10 | CO2 | L3 |

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| 5 | 1. Define and write short notes on MAP decision rule. | 4 | CO3 | L1 |
| 1. A simple probabilistic classifier based on applying Bayes Theorem where every feature is assumed to be class conditionally independent. Explain the context with suitable examples. | 6 | CO3 | L2 |
| 1. Consider the set of two-dimensional patterns   (1,1,1), (1, 2, 1), (1, 3, 1), (2, 1, 1), (2, 2, 1), (2, 3,1), (2,3.5,1), (2.5,2,1), (3.5,1,1), (3.5, 2,1), (3.5, 3,2), (3.5,4,2), (4.5,1,2), (4.5,2,2), (4.5, 3,2), (5,4,2), (5, 5, 2), (6,3,2), (6,4,2),(6,5,2) where each pattern is represented by feature 1, feature 2 and the class.   1. If a test pattern P is at (3.8, 3.1), find the class of P using the NN algorithm. 2. Find the class of P using the kNN algorithm, where k is 3. 3. Find the class of P using MkNN algorithm, where k is 3. | 10 | CO3 | L3 |

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| 6 | 1. Explain the preprocessing ordered technique used to reduce the computational requirements for finding the k-nn. | 4 | CO3 | L1 |
| 1. Explain the cube algorithm in detail with the projection of the hypercube. | 6 | CO3 | L2 |
| 1. With necessary examples discuss the different types of Condensation algorithms. | 10 | CO3 | L3 |

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| 7 | 1. Explain First-order Markov Assumption and Stationarity assumption. | 4 | CO4 | L1 |
| 1. Describe the various elements of the HMM with its representation. | 6 | CO4 | L2 |
| 1. Implement the nearest neighbor “classifier for the feature vectors of different lengths. Also, find the accuracy of the NN classifier. | 10 | CO4 | L3 |

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| 8 | 1. Write short notes on decision trees with the help of a diagram. | 4 | CO4 | L1 |
| 1. Discuss in detail about the classification in Markov Models. | 6 | CO4 | L2 |
| 1. Consider the digit data in below table and assume that each column corresponds to a state, obtain the state transition diagrams for the digits 1 and 7 which is described as 3\*3 matrices.  |  |  | | --- | --- | | Printed characters 1 & 7 | | | 0 0 1  0 0 1  0 0 1 | 1 1 1  0 0 1  0 0 1 | | 10 | CO4 | L3 |

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| 9 | 1. Write the expression to express the class variable C, over conditional distribution. | 4 | CO1 | L1 |
| 1. Prototype selection essentially entails finding the sample or set of samples to represent a larger set of samples. Explain any three strategies with their necessary representations. | 6 | CO1 | L2 |
| 1. Implement the process to generate random numbers with a desired density/distribution. | 10 | CO1 | L3 |

OR

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| 10 | 1. Discuss overfitting and pruning and give its advantages and disadvantages. | 4 | CO2 | L1 |
| 1. List and explain the types of weaknesses of decision trees. | 6 | CO2 | L2 |
| 1. With examples explain the types of impurity measures. | 10 | CO2 | L3 |