Name:

Enrolment No:

UPES

End Semester Examination, May 2025

Course: Pattern Recognition **Semester: II**

Program: MCA(AI&ML) & MTech (CSE) **Time: 03 hrs.**

Course Code: CSAI7025 **Max. Marks: 100**

Instructions: Attempt all.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between image enhancement and image restoration. Provide an example of an image enhancement technique.	**4**	**CO1**
Q 2	State the Cauchy-Schwarz inequality. Explain its relevance in evaluating the similarity between two feature vectors.	**4**	**CO2**
Q 3	Give two real-world examples of problems solved using neural networks. Describe briefly how neural networks are applied in each case.	**4**	**CO3**
Q 4	What are confusion matrix, accuracy, precision, and recall? How do they help in comparing the performance of classifiers?	**4**	**CO4**
Q 5	What are kernel methods? How do they help in handling non-linearly separable data in machine learning?	**4**	**CO3**
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Define conditional independence. Explain how it is used in graphical models to simplify joint distributions. Provide examples using both Bayesian and Markov networks.	**10**	**CO3**
Q 7	What are the fundamental principles of feature extraction in pattern recognition? Explain the difference between feature extraction and feature selection. Describe commonly used techniques like PCA and LDA and discuss how they help reduce dimensionality while preserving essential information.	**10**	**CO2**
Q 8	What is a potential function in the context of undirected graphical models? Explain its role in defining the joint probability distribution and describe how it differs from conditional probabilities in directed models.	**10**	**CO3**
Q 9	What is data condensation? Explain its importance in pattern recognition and machine learning. Describe methods like prototype selection and instance selection with examples of when each is suitable.	**10**	**CO4**
SECTION-C **(2Qx20M=40 Marks)**			

Q 10	How can sampling methods like Monte Carlo simulations be used in predicting uncertain weather conditions? Discuss how sampling helps approximate complex probability distributions in real-time forecasting.	**20**	**CO3**
Q 11	Explain the concept of probability density estimation (PDE). Discuss both parametric methods (such as using Gaussian distributions) and non-parametric methods (such as kernel density estimation) for estimating probability densities of datasets. Provide examples of when each method is appropriate and discuss how PDE helps in tasks like anomaly detection, classification, or data generation.	**20**	**CO4**