Reg. No.															

Question Paper Code	13396

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Eighth Semester

Artificial Intelligence and Data Science

20AIEL808 - AUTOMATED RECOGNITION SYSTEMS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What is the primary goal of pattern recognition? (a) Image compression (b) Data encryption (c) To classify data into predefined categories (d) Data mining	1	K1	CO1
2.	A discriminant function aims to: (a) Minimize the distance between data points (b) Separate data points of different classes (c) Maximize the variance within a class (d) Reduce the dimensionality of the data	1	K1	CO1
3.	What is the primary goal of clustering? (a) To classify data into predefined categories (b) To group similar data points together (c) To predict a continuous value (d) To reduce the dimensionality of data	1	K1	CO2
4.	Hierarchical clustering creates a: (a) Single partition of the data (b) Hierarchy of clusters (c) Set of rules (d) Linear model	1	K1	CO2
5.	What is the primary goal of feature selection? (a) Increase the number of features (b) Reduce dimensionality and improve model performance (c) Add random noise to the dataset (d) Make training slower	1	K1	CO3
6.	What is the Peaking Phenomenon in feature selection? (a) A method for selecting the best feature (b) When adding more features decreases performance (c) A technique to improve class separability (d) A method for dimensionality reduction	1	K1	CO3
7.	What is a Hidden Markov Model (HMM)? (a) A deterministic model (b) A probabilistic model for sequential data (c) A type of clustering algorithm (d) A reinforcement learning algorithm	1	K1	CO4
8.	Which algorithm is used to compute the most probable sequence of hidden states? (a) Forward Algorithm (b) Viterbi Algorithm (c) Backward Algorithm (d) Sum-Product Algorithm	1	K1	CO4
9.	What is the range of membership values in fuzzy set theory? (a) 0 to 1 (b) -1 to 1 (c) Only 0 and 1 (d) 0 to infinity	1	K1	CO5
10.	In the context of neural networks, what is a synapse analogous to? (a) An edge or connection between neurons (b) A neuron itself (c) A membership function (d) A cluster center	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Differentiate between supervised and unsupervised learning.	2	K2	CO1
12.	What is the significance of Bayes Theorem in pattern classification?	2	K1	CO1
13.	Differentiate hierarchical and partitional clustering.	2	K2	CO2

14.	Define the K-means clustering algorithm.	*2*	*K1*	*CO2*
15.	Define the use of the ROC curve in evaluating feature selection.	*2*	*K1*	*CO3*
16.	State one class separability measure used in feature selection.	*2*	*K1*	*CO3*
17.	Differentiate between a Markov Model and a Hidden Markov Model.	*2*	*K2*	*CO4*
18.	What are the three main components of an HMM?	*2*	*K1*	*CO4*
19.	List the key characteristics of a membership function and provide an example of a common type used in fuzzy systems.	*2*	*K1*	*CO5*
20.	State the Hebbian learning rule.	*2*	*K1*	*CO5*
21.	Recall the challenges presented by overlapping classes in data.	*2*	*K1*	*CO6*
22.	Show the role of activation functions in neural networks.	*2*	*K2*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the steps involved in designing a pattern recognition system.	*11*	*K2*	*CO1*
		OR			
	b)	Discuss the advantages and disadvantages of the Naive Bayesian Classifier. Relate the circumstances in which it is most suitable.	*11*	*K2*	*CO1*
24.	a)	Summarize the challenges of clustering large datasets and describe techniques for addressing these challenges.	*11*	*K2*	*CO2*
		OR			
	b)	Illustrate the various distance metrics used in clustering and their suitability for different types of data.	*11*	*K2*	*CO2*
25.	a)	Infer various class separability measures and their applications in feature selection.	*11*	*K2*	*CO3*
		OR			
	b)	Describe the role of parametric models in optimal feature generation with examples.	*11*	*K2*	*CO3*
26.	a)	Extend the Viterbi algorithm in detail with a step-by-step example.	*11*	*K2*	*CO4*
		OR			
	b)	Compare and contrast HMM and SVM in terms of their use cases.	*11*	*K2*	*CO4*
27.	a)	Identify the fundamental principles of fuzzy set theory and compare them with classical (crisp) set theory. In your answer, explain how fuzzy sets handle uncertainty and provide examples of applications where this approach is advantageous.	*11*	*K3*	*CO5*
		OR			
	b)	Develop the architecture of an elementary neural network used for pattern recognition. Detail the roles of neurons, weights, biases, and activation functions, and explain how these elements interact to perform classification tasks.	*11*	*K3*	*CO5*
28.	a)	Discuss the process of error minimization in neural network training and how gradient descent is utilized within this framework.	*11*	*K2*	*CO6*
		OR			
	b)	Illustrate the application of gradient descent in training neural networks, particularly within the ADALINE model, and discuss its benefits.	*11*	*K2*	*CO6*