Q. Code: 696898

Reg. No. | | | | | | | | | | | | | |

M.E/ M. TECH.DEGREE EXAMINATIONS, MAY 2024

First Semester

IR22004 – MACHINE LEARNING IN AUTOMATION SYSTEMS

(Mechanical Engineering)

(Regulation 2022)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Students will gain knowledge about basic concepts of Machine Learning.	**2**
CO 2	Students will be able to identify machine learning techniques suitable for a given problem.	**3**
CO 3	Students will solve the problems using various machine learning techniques.	**4**
CO 4	Students will be able to apply dimensionality reduction techniques.	**3**
CO 5	Students will be able to design application using machine learning techniques.	**5**

PART- A(20x2=40Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Define Temporal Difference Learning and provide an example of its application.	**1**	**2**
2.	Describe the key principle behind Support Vector Machines in classification.	**1**	**2**
3.	What is the main idea behind Naive Bayes classifier, and why is it called "naive"?	**1**	**2**
4.	Differentiate between Linear Regression and Logistic Regression	**1**	**2**
5.	What is the primary objective of the Expectation-Maximization (EM) algorithm?	**2**	**4**
6.	Describe the Fuzzy K-Means algorithm and its significance in clustering.	**2**	**2**
7.	How does the Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm work, and what are its key parameters?	**2**	**4**
8.	What is the fundamental idea behind the Apriori algorithm in association rule learning?	**2**	**2**
9.	Describe the concept of a Probabilistic Neural Network (PNN) and its applications.	**3**	**2**
10.	How does a Hopfield Network store and recall patterns?	**3**	**4**
11.	Discuss the working principle of a Self-Organizing Map (SOM) and its applications.	**3**	**2**
12.	Explain the basic functioning of a perceptron model	**3**	**2**
13.	Define a fuzzy set and explain its basic concepts.	**4**	**2**
14.	What are fuzzy logic controllers, and how do they operate? Provide an example of an industrial application.	**4**	**3**
15.	Describe fuzzy decision-making and its advantages over conventional decision-making	**4**	**2**

approaches

16.	Provide an example of a fuzzy pattern recognition application and explain its operation.	**4**	**3**
17.	Describe the selection process in genetic algorithms. How does it contribute to the evolution of solutions?	**5**	**2**
18.	What is mutation in the context of genetic algorithms? How does it introduce diversity in the population?	**5**	**3**
19.	How does Particle Swarm Optimization (PSO) differ from Genetic Algorithms (GA)?	**5**	**3**
20.	Why is it important to define proper termination conditions in genetic algorithms	**5**	**3**

PART- B (5x 10=50Marks)

		Marks	CO	RBT LEVEL
21. (a)	Explain the concept of linear regression and logistic regression. Compare and contrast their applications in predictive modeling.	**(10)**	**1**	**2**
	(OR)			
(b)	Explain the concepts of decision trees and random forests. Discuss the advantages and disadvantages of each algorithm in the context of classification and regression tasks.	**(10)**	**1**	**2**
22. (a)	Illustrate the Expectation-Maximization (EM) algorithm in the context of unsupervised learning. Provide a step-by-step breakdown of how it works and discuss its applications in vector quantization and clustering.	**(10)**	**2**	**3**
	(OR)			
(b)	Brief the Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm. Compare and contrast it with other clustering algorithms such as k-means and hierarchical clustering.	**(10)**	**2**	**3**
23. (a)	Explain the architecture and learning process of a Back-Propagation Neural Network (BPN). Discuss its advantages and limitations compared to other neural network models.	**(10)**	**3**	**4**
	(OR)			
(b)	Compare and contrast Adaptive Resonance Theory 1 (ART1) and Adaptive Resonance Theory 2 (ART2) neural networks. Discuss their applications and limitations, with reference to real-world case studies on genetic algorithm	**(10)**	**3**	**4**

(GA) based algorithm development.

24. (a)	Explain the basic concepts in Fuzzy Set theory and how they form the foundation for Fuzzy logic controllers with example to illustrate the application of Fuzzy logic controllers in various industrial contexts.	**(10)**	**4**	**3**
	(OR)			
(b)	Discuss the principles underlying adaptive Fuzzy systems and their significance in real-world applications. Provide a case study illustrating the development and implementation of an adaptive Fuzzy system in a practical scenario.	**(10)**	**4**	**3**
25. (a)	Discuss the process of initializing, selecting, mutating, and terminating genetic algorithms. Brief with examples to illustrate each steps in detail.	**(10)**	**5**	**4**
	(OR)			
(b)	Compare and contrast genetic algorithms (GAs) with other metaheuristic optimization techniques such as Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Tabu Search, and Reactive Search Optimization (RSO) in terms of their underlying principles, advantages, and limitations.	**(10)**	**5**	**4**

PART- C (1x 10=10Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	How does DBSCAN differ from centroid-based clustering methods like K-Means? Analyze concept of core points, border points, and noise points in DBSCAN, and explain how they contribute to cluster formation with relevant examples.	**(10)**	**2**	**5**

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