

# SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)  
SRM Nagar, Kattankulathur – 603 203

## DEPARTMENT OF MANAGEMENT STUDIES

### QUESTION BANK



### III SEMESTER

### DATA MINING FOR BUSINESS INTELLIGENCE

**Academic Year 2025-2026 (Odd Semester)**

**Regulation – 2023**

*Prepared by*

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# SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203.

## MASTER OF BUSINESS ADMINISTRATION

### QUESTION BANK



**SUBJECT: PBA402 - DATA MINING FOR BUSINESS INTELLIGENCE**

**SEM / YEAR: III / II**

#### UNIT I – INTRODUCTION

**Data mining definitions, applications, origins, growth, Text mining, Web mining, Spatial mining, Process mining, Data ware house and data marts.**

#### PART-A

Q.No	Questions	BT Level	Competence
1	Define data mining.	BTL1	Remembering
2	What is knowledge discovery in databases (KDD)?	BTL1	Remembering
3	Differentiate between data mining and machine learning.	BTL2	Understanding
4	Write the main steps in the data mining process?	BTL2	Understanding
5	List any two data mining techniques.	BTL1	Remembering
6	Mention two business applications of data mining.	BTL2	Understanding
7	Name two industries where data mining is widely used.	BTL1	Remembering
8	How is data mining used in fraud detection?	BTL2	Understanding
9	What role does data mining play in customer relationship management (CRM)?	BTL1	Remembering
10	Give two applications of data mining in healthcare.	BTL2	Understanding
11	What is the origin of data mining as a field?	BTL1	Remembering
12	How did the growth of big data influence data mining?	BTL2	Understanding
13	Infer the role of databases play in the evolution of data mining?	BTL1	Remembering
14	When did data mining emerge as a distinct research area?	BTL2	Understanding
15	Name two technologies that contributed to the growth of data mining.	BTL2	Understanding
16	What is text mining?	BTL2	Understanding
17	How is text mining different from data mining?	BTL2	Understanding
18	Name two techniques used in text mining.	BTL1	Remembering
19	Define web mining.	BTL2	Understanding
20	Mention two types of web mining.	BTL1	Remembering
21	What is spatial data mining?	BTL1	Remembering
22	Give one application of spatial mining.	BTL1	Remembering

23	What is process mining?	BTL1	Remembering
24	Mention one key goal of process mining	BTL1	Remembering

**PART-B**

Q. No	Questions	Marks	BT Level	Competence
1	(i) Explain the concept of data mining. (ii) Discuss its importance in decision-making and its relationship with other fields such as statistics, machine learning, and database management.	(08) (08)	BTL3	Applying
2	Describe the process of Knowledge Discovery in Databases (KDD). Explain each step in detail and discuss how KDD integrates with data mining.	(16)	BTL4	Analyze
3	Compare and contrast the different data mining techniques, such as classification, clustering, regression, and association rule mining. Provide examples of real-world applications for each technique.	(16)	BTL4	Analyze
4	(i) Discuss the challenges and issues in data mining, such as data quality, privacy concerns, and ethical implications. (ii) How can these challenges be addressed?	(16)	BTL4	Analyze
5	Analyze the role of data mining in the healthcare industry. Discuss its applications in disease prediction, patient care, and drug discovery, providing specific examples.	(16)	BTL4	Analyze
6	Discuss how data mining is applied in marketing and customer relationship management (CRM). Provide examples of techniques such as customer segmentation and market basket analysis.	(16)	BTL3	Apply
7	Explain the role of data mining in fraud detection and prevention. Provide real-world examples where data mining techniques have successfully identified fraudulent activities.	(16)	BTL3	Apply
8	Evaluate the application of data mining in the financial sector. Discuss its use in credit scoring, risk management, and investment analysis, with relevant examples.	(16)	BTL3	Apply
9	Discuss the role of data mining in the retail industry. How can it be used for inventory management, demand forecasting, and personalized marketing strategies?	(16)	BTL3	Analyze
10	Describe how data mining can be used in social media analysis. Discuss techniques like sentiment analysis and social network analysis, and provide examples of their use.	(16)	BTL4	Analyze
11	Explain the concept of text mining. Discuss its techniques, challenges, and applications in fields such as sentiment analysis, information retrieval, and natural language processing (NLP).	(16)	BTL4	Analyze
12	Describe web mining and its three main types: web content mining, web structure mining, and web usage mining. Discuss their applications in e-commerce, search engines, and online behavior analysis.	(16)	BTL4	Analyze
13	Define spatial data mining. Discuss the unique challenges of mining spatial data and its applications in areas such as urban planning, environmental monitoring, and geographical information systems (GIS).	(16)	BTL4	Analyze

14	Explain the concept of text mining. Discuss its techniques, challenges, and applications in fields such as sentiment analysis, information retrieval, and natural language processing (NLP).	(16)	BTL4	Analyze
15	Discuss the historical origins of data mining. How has the evolution of data warehousing, statistical analysis, and machine learning influenced the development of data mining?	(16)	BTL4	Analyze
16	Evaluate the growth of data mining with the advent of big data. Discuss how big data technologies, such as Hadoop and Spark, have impacted the scalability and efficiency of data mining.	(16)	BTL3	Apply
17	Analyze the role of artificial intelligence and machine learning in the evolution of data mining techniques. How have AI and ML algorithms enhanced the capabilities of data mining?	(16)	BTL3	Apply

### UNIT II- DATA MINING PROCESS

**Data mining process – KDD, CRISP-DM, SEMMA and Domain – Specific, Classification and Prediction performance measures – RSME, MAD, MAP, MAPE, Confusion matrix, Receiver operating Characteristic curve & AUC; Validation Techniques – hold-out, k-fold cross-validation, LOOCV, random subsampling, and bootstrapping.**

Q.No	Questions	BT Level	Competence
1	What is the Knowledge Discovery in Databases (KDD) process?	BTL1	Remembering
2	Infer the CRISP-DM methodology.	BTL2	Understanding
3	What does SEMMA stand for, and what is its purpose in data mining?	BTL1	Remembering
4	What is the role of domain-specific approaches in data mining?	BTL1	Remembering
5	How does the data mining process differ from the KDD process?	BTL2	Understanding
6	What are the key differences between CRISP-DM and SEMMA?	BTL1	Remembering
7	Explain the concept of data preprocessing in the data mining process.	BTL2	Understanding
8	What is the purpose of the data transformation step in the KDD process?	BTL1	Remembering
9	Define the term "data cleaning" in the context of data mining.	BTL2	Understanding
10	What is Root Mean Square Error (RMSE) in the context of model performance?	BTL1	Remembering
11	Explain Mean Absolute Deviation (MAD) as a performance measure in data mining.	BTL2	Understanding
12	What is Mean Absolute Percentage Error (MAPE) used for in model evaluation?	BTL1	Remembering
13	How is the Confusion Matrix used to evaluate the performance of a classification model?	BTL2	Understanding
14	What are True Positives, False Positives, True Negatives, and False Negatives in the context of a Confusion Matrix?	BTL1	Remembering
15	Explain the concept of Receiver Operating Characteristic (ROC) curve.	BTL2	Understanding
16	What does the Area Under the Curve (AUC) represent in ROC analysis?	BTL1	Remembering
17	How do you interpret the AUC value in model evaluation?	BTL2	Understanding
18	What is the hold-out validation technique?	BTL1	Remembering
19	Describe k-fold cross-validation and its advantages.	BTL2	Understanding
20	What is Leave-One-Out Cross-Validation (LOOCV)? How does it differ from k-fold cross-validation?	BTL2	Understanding
21	Explain random subsampling in the context of model validation.	BTL2	Understanding
22	What is bootstrapping in model validation, and how does it work?	BTL2	Understanding
23	Compare and contrast bootstrapping and k-fold cross-validation.	BTL2	Understanding

24	Why is cross-validation considered important in data mining?	BTL2	Understanding
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**PART-B**

Q.No	Questions	Marks	BT Level	Competence
1	Discuss the Knowledge Discovery in Databases (KDD) process in detail. Explain each step, and describe its significance in the overall data mining pipeline.	(16)	BTL4	Analyzing
2	Elaborate on the CRISP-DM methodology. Discuss its six phases and the significance of each phase in the data mining process.	(16)	BTL4	Analyzing
3	Describe the SEMMA methodology used in data mining. Discuss its five phases and provide examples of how it can be applied in real-world data mining tasks.	(16)	BTL4	Analyzing
4	Discuss the importance of data preprocessing in the data mining process. Explain the steps involved in data cleaning, transformation, and normalization, and their impact on model performance.	(16)	BTL4	Analyzing
5	Explain the concept of data transformation in the data mining process. How does it aid in improving the performance of data mining models, and what are some common techniques used?	(16)	BTL4	Analyzing
6	Analyze the significance of feature selection in data mining. Discuss the techniques for feature selection and its impact on improving model accuracy and reducing overfitting.	(16)	BTL4	Analyzing
7	Discuss the challenges involved in the data mining process. What are the common issues such as data quality, noise, and data imbalance, and how can they be addressed?	(16)	BTL4	Analyzing
8	What is Root Mean Square Error (RMSE)? Discuss how RMSE is used to evaluate prediction models and explain the significance of RMSE in model performance.	(16)	BTL3	Applying
9	Describe Mean Absolute Deviation (MAD) as a performance metric. How does MAD help assess the accuracy of a predictive model, and how is it different from other error metrics?	(16)	BTL3	Applying
10	Discuss the concept of Mean Absolute Percentage Error (MAPE). How does it work, and why is it important in evaluating prediction models in business and economics?	(16)	BTL4	Analyzing
11	What is the Confusion Matrix? Discuss how it helps evaluate the performance of classification models. Include explanations of True Positives, False Positives, True Negatives, and False Negatives.	(16)	BTL3	Applying
12	Explain the Receiver Operating Characteristic (ROC) curve. How is it used to evaluate classification models, and what information can be derived from the ROC curve?	(16)	BTL4	Analyzing
13	What is the Area Under the Curve (AUC)? Discuss how AUC is used to evaluate the performance of binary classification models, and explain the significance of AUC values.	(16) (16)	BTL4	Analyzing
14	Discuss the hold-out validation technique. Explain how it works, its advantages, and its limitations when used in model evaluation.	(16)	BTL3	Applying
15	Explain the k-fold cross-validation technique. How does it provide a more reliable estimate of model performance, and what are the typical values for 'k' used in practice?	(16)	BTL3	Applying

16	What is Leave-One-Out Cross-Validation (LOOCV)? Compare LOOCV with k-fold cross-validation, and explain when LOOCV is more beneficial for model validation.	(16)	BTL4	Analyzing
17	Discuss the concept of random subsampling for model validation. Explain how it works, its benefits, and its limitations when compared to other cross-validation techniques.	(16)	BTL4	Analyzing

### UNIT III- PREDICTION TECHNIQUES

**Data Visualization, Time series – ARIMA, Winter Holts, Vector Autoregressive analysis, Multivariate regression analysis.**

#### PART-A

Q.No	Questions	BT Level	Competence
1	What is data visualization?	BTL1	Remembering
2	How do bar charts and line graphs differ in data visualization?	BTL2	Understanding
3	Write the purpose of a scatter plot in data visualization?	BTL1	Remembering
4	Infer the role of histograms in visualizing the distribution of data.	BTL2	Understanding
5	What is a box plot, and how does it help in understanding the spread of data?	BTL2	Understanding
6	Define a heatmap in data visualization.	BTL1	Remembering
7	Point out the significance of pie charts in data visualization?	BTL1	Remembering
8	How can a time series plot be used to identify trends and patterns in data?	BTL2	Understanding
9	List out the benefits of using interactive visualizations in data analysis?	BTL1	Remembering
10	What is a time series, and why is it important for predictive modeling?	BTL2	Understanding
11	Recite the concept of stationarity in time series analysis.	BTL1	Remembering
12	Summarize the trend, seasonality, and noise in time series data?	BTL2	Understanding
13	How does the ARIMA model address trend and seasonality in time series forecasting?	BTL2	Understanding
14	What does ARIMA stand for, and what are its key components?	BTL2	Understanding
15	Compare ARIMA and SARIMA in time series forecasting?	BTL2	Understanding
16	Mention the concept of autocorrelation in time series analysis.	BTL2	Understanding
17	What is the role of p, d, and q parameters in the ARIMA model?	BTL2	Understanding
18	What is the Winter's Holt method, and how does it differ from ARIMA for forecasting?	BTL1	Remembering
19	Point out the concept of smoothing in the context of Winter's Holt method.	BTL2	Understanding
20	How does Winter's Holt model handle both trend and seasonality in time series forecasting?	BTL2	Understanding

21	What is the role of seasonal components in Winter's Holt method, and how are they incorporated?	BTL2	Understanding
22	What is Vector Autoregressive (VAR) analysis, and when is it used in prediction modeling?	BTL2	Understanding
23	Explain how VAR models are used for forecasting multivariate time series data.	BTL2	Understanding
24	What are the key assumptions of the VAR model?	BTL1	Remembering

**PART B**

Q.No	Questions	Marks	BT Level	Competence
1	(i) Discuss the importance of data visualization in predictive modeling. (ii) Explain the various types of charts and graphs used in data visualization, such as histograms, scatter plots, and box plots, and provide examples of their usage.	(08) (08)	BTL4	Analyzing
2	Discuss the tools and techniques used for creating interactive visualizations and their benefits in real-time data analysis.	(16)	BTL3	Applying
3	Explain the process of visualizing time series data. Discuss the different techniques used to identify trends, seasonality, and anomalies in time series plots, and explain their significance in making predictions.	(16)	BTL3	Analyzing
4	Illustrate how correlation matrices and heatmaps help in understanding patterns and making decisions.	(16)	BTL3	Applying
5	Summarize the advantages and limitations of using pie charts in data visualization. In which situations are pie charts effective, and when should alternative chart types be used?	(16)	BTL3	Applying
6	Describe the concept of stationarity in time series analysis. Discuss why stationarity is important for building reliable forecasting models and how to test for stationarity in a time series dataset.	(16)	BTL4	Analyzing
7	Discuss the process of decomposing a time series. Explain the different components of a time series, such as trend, seasonality, and noise, and describe how decomposition can help in understanding the underlying patterns.	(16)	BTL3	Applying
8	(i) Compare and contrast ARIMA and SARIMA models for time series forecasting. (ii) Discuss the differences between the two models and provide examples of when each model is most appropriate for use.	(08) (08)	BTL4	Analyzing
9	Describe the steps involved in building an ARIMA model for time series forecasting. Discuss how to determine the values of p, d, and q and how to evaluate the model's performance.	(16)	BTL3	Applying
10	Evaluate the impact of autocorrelation on time series forecasting. Discuss how autocorrelation functions (ACF) and partial autocorrelation functions (PACF) are used to analyze and select the appropriate lag values for time series models.	(16)	BTL3	Applying
11	Discuss the methodology behind this approach and how it is different from other time series models like ARIMA.	(16)	BTL4	Analyzing
12	(i) Discuss the concept of smoothing in Winter's Holt method. (ii) Explain how exponential smoothing is applied to trend and seasonal data, and describe how it adjusts forecasts based on previous observations.	(08) (08)	BTL4	Analyzing

13	(i)Compare Winter's Holt method with the simple exponential smoothing and ARIMA models. (ii)Discuss the advantages and disadvantages of Winter's Holt in handling seasonality and trend components in time series data.	(08) (08)	BTL3	Applying
14	(i)Explain the steps involved in using Winter's Holt method for forecasting.	(16)	BTL3	Applying
15	Explain the concept of Vector Autoregressive (VAR) analysis and its application in time series forecasting.	(16)	BTL3	Analyzing
16	Compare the Vector Autoregressive (VAR) model with univariate models like ARIMA. Discuss the advantages of VAR in analyzing and forecasting multivariate time series data.	(16)	BTL3	Analyzing
17	Discuss the process of building a VAR model. Explain how to select the number of lags, how to test for stationarity, and how to interpret the coefficients of the model.	(16)	BTL3	Applying

<b>UNIT IV- CLASSIFICATION AND CLUSTERING TECHNIQUES</b>			
<b>Classification – Decision trees, k nearest neighbours, Logistic regression, Discriminant analysis; Clustering; Market based analysis.</b>			
<b>PART-A</b>			
<b>Q.No</b>	<b>Questions</b>	<b>BT Level</b>	<b>Competence</b>
1	What is a decision tree in classification?	BTL1	Remembering
2	Explain the concept of entropy in decision trees.	BTL1	Remembering
3	What are the advantages of using decision trees for classification?	BTL1	Remembering
4	What is the K-Nearest Neighbors (KNN) algorithm?	BTL2	Understanding
5	How does the KNN algorithm classify data points?	BTL2	Understanding
6	Explain the concept of distance metric in KNN.	BTL1	Remembering
7	What is logistic regression, and how is it used for classification?	BTL1	Remembering
8	What is the difference between linear regression and logistic regression?	BTL1	Remembering
9	What are the assumptions made by logistic regression in classification?	BTL2	Understanding
10	Explain the concept of discriminant analysis in classification.	BTL2	Understanding
11	What is clustering in data mining?	BTL1	Remembering
12	Describe the difference between classification and clustering.	BTL2	Understanding
13	Explain the concept of k-means clustering.	BTL2	Understanding
14	What is the main limitation of k-means clustering?	BTL1	Remembering
15	What is hierarchical clustering? How does it differ from k-means clustering?	BTL1	Remembering

16	Explain the term “centroid” in the context of clustering.	BTL2	Understanding
17	What are the common applications of clustering techniques?	BTL1	Remembering
18	How do you determine the optimal number of clusters in k-means clustering?	BTL2	Understanding
19	What is market-based analysis in data mining?	BTL1	Remembering
20	Explain the concept of association rules in market-based analysis.	BTL2	Understanding
21	What is the support measure in association rule mining?	BTL1	Remembering
22	What is confidence in the context of association rule mining?	BTL1	Remembering
23	What is lift in market-based analysis?	BTL1	Remembering
24	How is market basket analysis used in retail?	BTL2	Understanding

**PART-B**

Q.No	Questions	Marks	BT Level	Competence
1	Explain the construction of decision trees using the ID3 algorithm. Illustrate with an example.	(16)	BTL3	Applying
2	Discuss the Gini Index and Information Gain used in decision tree splitting. Compare both.	(16)	BTL4	Analyzing
3	Describe how overfitting occurs in decision trees and explain methods to prevent it.	(16)	BTL3	Applying
4	Explain pruning in decision trees. Differentiate between pre-pruning and post-pruning.	(16)	BTL4	Analyzing
5	Compare Decision Trees and Random Forest in terms of accuracy and interpretability.	(16)	BTL4	Analyzing
6	Explain the working principle of the K-Nearest Neighbor algorithm with a suitable example.	(16)	BTL3	Applying
7	Discuss the factors affecting the performance of the KNN algorithm.	(16)	BTL4	Analyzing
8	Describe how distance metrics impact the performance of KNN. Illustrate with examples.	(16)	BTL3	Applying
9	Explain the concept of logistic regression for binary classification problems.	(16)	BTL4	Analyzing
10	Derive the logistic regression model and explain the role of the sigmoid function.	(16)	BTL3	Applying
11	Discuss the limitations of logistic regression and how regularization helps in addressing them.	(16)	BTL4	Analyzing
12	How is the maximum likelihood estimation used in logistic regression training? Illustrate.	(16)	BTL3	Applying
13	Differentiate between linear regression and logistic regression with examples and applications.	(16)	BTL3	Applying
14	Explain Linear Discriminant Analysis (LDA) with assumptions and mathematical formulation.	(16)	BTL4	Analyzing

15	Compare Discriminant Analysis with Logistic Regression for classification problems.	(16)	BTL4	Analyzing
16	Explain the K-means clustering algorithm with an example. Discuss its advantages and limitations.	(16)	BTL3	Applying
17	Explain how to evaluate the quality of clustering. Discuss the Silhouette Coefficient and Davies-Bouldin Index.	(16)	BTL4	Analyzing

### UNIT -V : MACHINE LEARNING AND AI

**Genetic algorithms, Neural network, Fuzzy logic, Support Vector Machine, Optimization techniques –Ant Colony, Particle Swarm, DEA.**

PART-A			
Q.No	Questions	BT Level	Competence
1	What is a genetic algorithm in machine learning?	BTL1	Remembering
2	Explain the basic process of a genetic algorithm (GA).	BTL2	Understanding
3	What are the components of a genetic algorithm?	BTL1	Remembering
4	What is crossover in genetic algorithms?	BTL1	Remembering
5	How does mutation work in genetic algorithms?	BTL2	Understanding
6	What is a neural network in machine learning?	BTL1	Remembering
7	Explain the concept of a perceptron in a neural network.	BTL2	Understanding
8	What are activation functions in neural networks?	BTL1	Remembering
9	What is backpropagation in neural networks?	BTL1	Remembering
10	Explain the difference between a feedforward neural network and a recurrent neural network.	BTL2	Understanding
11	What is overfitting in the context of neural networks?	BTL1	Remembering
12	What is a neural network in machine learning?	BTL1	Remembering
13	What is fuzzy logic in artificial intelligence?	BTL1	Remembering
14	How does fuzzy logic differ from traditional Boolean logic?	BTL2	Understanding
15	What is a membership function in fuzzy logic?	BTL1	Remembering
16	Explain the concept of fuzzification in fuzzy logic.	BTL2	Understanding
17	What is defuzzification in fuzzy logic?	BTL1	Remembering
18	How can fuzzy logic be used for decision-making?	BTL2	Understanding
19	What is a Support Vector Machine (SVM) in machine learning?	BTL1	Remembering

20	What is the purpose of a kernel in Support Vector Machine (SVM)?	BTL1	Remembering
21	Explain the concept of a hyperplane in SVM.	BTL2	Understanding
22	What is the role of margin in SVM?	BTL1	Remembering
23	How does SVM handle non-linear data classification?	BTL2	Understanding
24	What is Ant Colony Optimization (ACO)?	BTL1	Remembering

<b>PART B</b>				
<b>Q.No</b>	<b>Questions</b>	<b>Marks</b>	<b>BT Level</b>	<b>Competence</b>
1	Explain the concept of Genetic Algorithms (GAs). Discuss the process of selection, crossover, and mutation in GAs, and provide examples of how they are applied in optimization problems.	(16)	BTL3	Applying
2	Discuss the role of fitness functions in Genetic Algorithms. How do different types of fitness functions impact the performance and convergence of a genetic algorithm?	(16)	BTL4	Analyzing
3	Compare and contrast Genetic Algorithms with other optimization techniques like simulated annealing and gradient descent. Discuss their advantages and limitations in real-world problem-solving.	(16)	BTL3	Applying
4	Describe the structure and working of a feedforward neural network. Explain how backpropagation helps in optimizing the weights of the network, and discuss the challenges involved in training deep neural networks.	(16)	BTL4	Analyzing
5	Explain the concept of activation functions in neural networks. Compare common activation functions like Sigmoid, ReLU, and Tanh, and discuss when each should be used in various types of neural network architectures.	(16)	BTL3	Applying
6	Discuss the overfitting problem in neural networks. Explain techniques like regularization, dropout, and early stopping to combat overfitting. Provide real-world examples where these techniques have been effectively used.	(16)	BTL3	Applying
7	Describe the different types of neural networks, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and deep belief networks (DBNs). Discuss their unique applications and how they differ from traditional neural networks.	(16)	BTL4	Analyzing
8	Explain the principles of fuzzy logic. Discuss how fuzzy sets and membership functions work in fuzzy logic systems, and provide examples of their use in decision-making and control systems.	(16)	BTL3	Applying
9	Discuss the difference between classical binary logic and fuzzy logic. How does fuzzy logic allow for more nuanced decision-making in real-world scenarios, and what are its advantages?	(16)	BTL4	Analyzing
10	Explain the process of fuzzification and defuzzification in fuzzy logic systems. Discuss how these processes are applied in control systems such as air conditioning or autonomous vehicles.	(16)	BTL4	Analyzing
11	Evaluate the use of fuzzy logic in handling uncertainty and imprecision in artificial intelligence applications. Provide examples of real-world problems where fuzzy logic has been applied successfully.	(16)	BTL3	Applying

12	Explain the concept of Support Vector Machines (SVM) in classification problems. Discuss how SVM constructs hyperplanes to separate data points into different classes, and explain the concept of margin in SVM.	(16)	BTL3	Applying
13	Discuss the different types of kernels used in Support Vector Machines, such as linear, polynomial, and radial basis function (RBF). Explain how kernels allow SVM to handle non-linearly separable data.	(16)	BTL4	Analyzing
14	Discuss the concept of the "kernel trick" in SVM. Explain how the kernel trick allows SVM to efficiently perform classification on complex, non-linear data by mapping data to a higher-dimensional space.	(16)	BTL4	Analyzing
15	Explain the concept of Ant Colony Optimization (ACO). Discuss how it mimics the behavior of ants to find the optimal path in optimization problems, and provide examples of real-world applications.	(16)	BTL3	Applying
16	Discuss the working mechanism of Particle Swarm Optimization (PSO). How does PSO use the concept of swarm intelligence to solve optimization problems, and what are its advantages over other optimization algorithms?	(16)	BTL4	Analyzing
17	Explain the Differential Evolution Algorithm (DEA). Discuss the main components of DEA, such as mutation, crossover, and selection, and provide examples of problems where DEA has been applied effectively.	(16)	BTL4	Analyzing

**Faculty In-Charge**

**HOD**