Reg. No.																

Question Paper Code	**13598**

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

Third Semester

Computer Science and Engineering (Cyber Security)

20SCPC303 - MACHINE LEARNING IN CYBER SECURITY

Regulation - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	Which of the following is a local search algorithm? (a) Hill-Climbing (b) Breadth-First Search (c) A* Search (d) Depth-First Search	*1*	*K1*	*CO1*
2.	Heuristic search strategies use heuristics to: (a) Improve memory efficiency (b) Randomly explore possible solutions (c) Find an optimal solution without any prior knowledge (d) Reduce the search space by providing an estimate of the best path	*1*	*K1*	*CO1*
3.	What does generalization in machine learning refer to? (a) The model's ability to perform well on training data (b) The model's ability to adapt to new, unseen data (c) The process of increasing model complexity (d) The ability to minimize loss on validation data	*1*	*K1*	*CO2*
4.	Which of the following is true about the difference between regression and classification in supervised learning? (a) Regression is used for categorical outputs, classification for continuous outputs (b) Regression is used for continuous outputs, classification for categorical outputs (c) Both are the same technique (d) Neither involves labelled data	*1*	*K1*	*CO2*
5.	What is the key assumption of Naive Bayes (a) Variables are dependent (b) Variables are independent given the class (c) Variables have equal variance (d) Variables are normally distributed	*1*	*K1*	*CO3*
6.	In Hidden Markov Models, the observations are: (a) Directly observable (b) Hidden but related to a sequence of states (c) Independent of the state (d) None of the above	*1*	*K1*	*CO3*
7.	Which of the following is true about LDA? (a) LDA is used for classification tasks. (b) LDA reduces dimensions while preserving as much variance as possible. (c) LDA can be used in both supervised and unsupervised learning. (d) LDA creates clusters based on data distribution.	*1*	*K1*	*CO4*
8.	In Support Vector Machines, what is the purpose of the kernel function? (a) To reduce the dimensionality of the input features (b) To transform non-linear data into a higher-dimensional space (c) To classify data with linear boundaries (d) To minimize the variance of the model	*1*	*K1*	*CO4*
9.	The posterior probability in Bayesian inference is calculated by: (a) Likelihood * Prior / Evidence (b) Likelihood * Evidence / Prior (c) Prior * Evidence (d) None of the above.	*1*	*K1*	*CO5*
10.	The curse of dimensionality refers to: (a) The challenge of making predictions with a large number of input features (b) The tendency of machine learning models to overfit when there is too much data (c) The challenge of solving optimization problems with a small number of variables (d) The tendency for data points to become indistinguishable as dimensionality increases	*1*	*K1*	*CO6*

PART - B (12 × 2 = 24Marks)

Answer ALL Questions

11. Differentiate between uninformed search and heuristic search strategies. *2 K2 CO1*

12. Define constraint satisfaction problem (CSP). *2 K1 CO1*

13. State the purpose of a decision tree in supervised learning. *2 K2 CO2*

14. Compare and contrast classification and regression. *2 K2 CO2*

15. What is the Naive Bayes algorithm used for? *2 K1 CO3*

16. Discuss on the working of the K-Nearest Neighbour (KNN) algorithm. *2 K2 CO3*

17. Define clustering in unsupervised learning. *2 K2 CO4*

18. Discuss how does dimensionality reduction help with in machine learning? *2 K2 CO4*

19. What is the posterior probability in Bayesian inference? *2 K1 CO5*

20. List the key characteristic of hierarchical clustering. *2 K1 CO5*

21. Compare and contrast the main difference between supervised and unsupervised learning. *2 K2 CO6*

22. What is a common limitation of unsupervised learning in cyber security? *2 K1 CO6*

PART - C (6 × 11=66 Marks)

Answer ALL Questions

23. a) Explain the various types of uninformed search strategies with suitable examples. *11 K1 CO1*

OR

b) Explain 8-puzzle problem and queen problem in detail along with goal state and problem formulation in detail. *11 K1 CO1*

24 a) Discuss the steps involved in building a decision tree. How does inductive bias affect the construction of a decision tree? *11 K2 CO2*

OR

b) Describe the different types of supervised learning in detail. *11 K2 CO2*

25. a) Apply the Naive Bayes algorithm to a simple classification problem. Explain each step in detail and show how probabilities are calculated. *11 K3 CO3*

OR

b) Explain in detail the working of Naive Bayes, and its application, compute for the given table values *11 K3 CO3*

S.NO	WEATHER	PLAY
1	SUNNY	NO
2	OVERCAST	YES
3	RAINY	YES
4	SUNNY	YES
5	SUNNY	YES
6	OVERCAST	YES
7	RAINY	NO
8	RAINY	NO
9	SUNNY	YES
10	RAINY	YES
11	SUNNY	NO
12	OVERCAST	YES
13	OVERCAST	YES
14	RAINY	NO

26.	a)	Define clustering and describe different clustering techniques such as K-means, hierarchical clustering, and spectral clustering.	*11*	*K2*	*CO4*
		OR			
	b)	Describe the impact of the curse of dimensionality on clustering algorithms. How do dimensionality reduction techniques like PCA help in overcoming this challenge?	*11*	*K2*	*CO4*
27.	a)	Describe the working principles of Bayesian inference. How is it applied in decision-making under uncertainty?	*11*	*K1*	*CO5*
		OR			
	b)	Explain causal networks in detail with example.	*11*	*K1*	*CO5*
28.	a)	Analyze the importance of dimensionality reduction techniques like Principal Component Analysis (PCA) in handling large cyber security datasets. How does reducing dimensions improve the performance of machine learning models in security?	*11*	*K4*	*CO6*
		OR			
	b)	Analyze the application of K-Nearest Neighbors (KNN) in detecting malicious behavior in cyber security. What are the strengths and weaknesses of using KNN in this context?	*11*	*K4*	*CO6*