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Question Paper Code	13856
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025**

Seventh Semester

**Artificial Intelligence and Data Science**

**20AIEL715 - ARTIFICIAL INTELLIGENCE SEARCH METHODS FOR PROBLEM SOLVING**

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (10 × 1 = 10 Marks)**

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Which search strategy is also called as blind search? (a) Uninformed      (b) Informed      (c) Simple reflex      (d) All of the mentioned	1	K1	CO1
2. _____ are mathematical problems defined as a set of objects whose state must satisfy a number of constraints or limitations. (a) Constraints Satisfaction Problems      (b) Uninformed Search Problems (c) Local Search Problems      (d) All of the mentioned	1	K1	CO1
3. In semantic networks, the relation between two nodes is typically represented by _____. (a) A propositional formula      (b) A logical connective (c) A directed labelled edge      (d) A substitution rule	1	K1	CO2
4. What is the purpose of unification in First-Order Logic (FOL)? (a) To check the syntactic structure of logical sentences (b) To make two logical expressions identical by finding a suitable substitution (c) To determine the truth value of a logical expression (d) To check the completeness of a logical system	1	K1	CO2
5. A Hybrid Bayesian network contains _____. (a) Both discrete and continuous variables      (b) Only Discrete variables (c) Only Discontinuous variable      (d) Both Discrete and Discontinuous variable	1	K1	CO3
6. A Markov Decision Process (MDP) consists of: _____. (a) States, Actions, Rewards, and Transition Probabilities (b) Nodes, Edges, Probabilities, and Cycles (c) Policies, Loss Functions, and Weights (d) States, Graphs, and Neurons	1	K1	CO3
7. Reinforcement learning methods learned through _____. (a) Experience      (b) Predictions      (c) Analyzing the data      (d) None	1	K1	CO4
8. Which of the following techniques is used to optimize a multivariate convex function? (a) Gradient Descent      (b) Simulated Annealing (c) Genetic Algorithm      (d) Random Search	1	K1	CO4
9. What is the primary goal of the Vector Space Model in Information Retrieval? (a) Compress data for storage efficiency (b) Measure document relevance to a query (c) Rank search engine results based on popularity (d) Ensure privacy in document storage	1	K1	CO5
10. In an autonomous agent's architecture, the component responsible for selecting actions based on perceptions is typically known as: _____. (a) Perception module      (b) Decision-making unit (c) Reactive layer      (d) Execution module	1	K1	CO6

**PART - B (12 × 2 = 24 Marks)**

Answer ALL Questions

- |  |   |    |     |
|--|---|----|-----|
| 11. When a heuristic function $h$ is said to be admissible?                                    | 2 | K1 | CO1 |
| 12. Compare Uninformed Search and informed Search strategies.                                  | 2 | K2 | CO1 |
| 13. State the significance of unification in knowledge representation.                         | 2 | K1 | CO2 |
| 14. How do frames differ from semantic networks?   | 2 | K1 | CO2 |
| 15. Differentiate between forward chaining and backward chaining in rule-based systems.        | 2 | K2 | CO3 |
| 16. Why can't we use linear regression for classification problems?                            | 2 | K1 | CO3 |
| 17. What is the basic principle of the k-Nearest Neighbours (kNN) algorithm?                   | 2 | K1 | CO4 |
| 18. How does step size affect the performance of Multivariate Hill Climbing?                   | 2 | K1 | CO4 |
| 19. Describe the process of tokenization and its importance in NLP.                            | 2 | K2 | CO5 |
| 20. How is the similarity between a document and a query calculated in the Vector Space Model? | 2 | K1 | CO5 |
| 21. List two applications of Speech Understanding technology in real-world scenarios.          | 2 | K1 | CO6 |
| 22. What is meant by "bounded rationality" in the context of autonomous agents?                | 2 | K1 | CO6 |

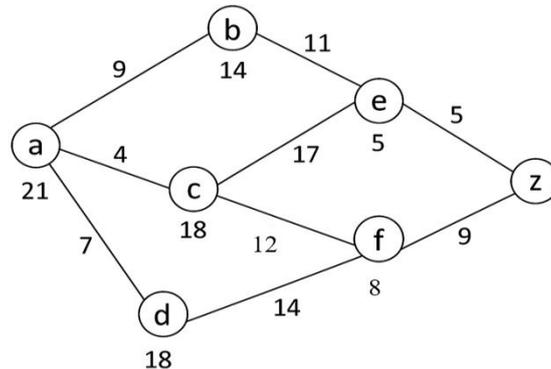
**PART - C (6 × 11 = 66 Marks)**

Answer ALL Questions

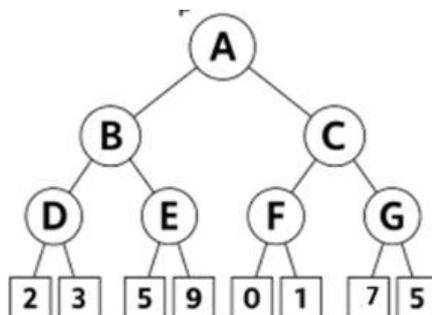
23. a) Discuss the B\* search algorithm in detail and demonstrate how it determines the optimal path in a graph. 11 K2 CO1

**OR**

- b) Explain in detail about A\* search algorithm and find the optimal path for the given graph. 11 K2 CO1



24. a) Use the concept of the Alpha-Beta pruning algorithm to explain how it functions in game playing. Describe how it improves the efficiency of the Min-Max algorithm by reducing the number of nodes evaluated in a given game tree. 11 K3 CO2



**OR**

- b) Apply the principles of First-Order Predicate Logic (FOL) to represent real-world statements formally. Explain in detail the concept of First-Order Predicate Logic, including its main components such as predicates, quantifiers, and logical connectives. Convert the following given facts into First-Order Logic expressions for the given situation:
- i) All bunnies are cute.
  - ii) Every student who is taking AI is cool.
  - iii) Every bunny who is a student taking AI is cute and cool.
  - iv) There is at least one student who doesn't hate the AI subject.
  - v) John likes all kinds of food.
  - vi) Apple and vegetable are food.
  - vii) Anything anyone eats and is not killed is food.
  - viii) Anil eats peanuts and is still alive.
  - ix) Harry eats everything that Anil eats.
25. a) Analyze how the working principles of the Naive Bayes classifier can be applied to a text classification task such as spam detection. Explain how its key assumptions influence the model's performance and decision-making process in this context. 11 K3 CO2
- OR**
- b) Analyze how the components of a Markov Decision Process (MDP) can be applied to model the behavior of a robot vacuum cleaner operating in a small home environment. Discuss how the states, actions, transition probabilities, rewards, and discount factor interact to influence the robot's decision-making and performance. 11 K4 CO3
26. a) Apply the principles of the k-Nearest Neighbors (kNN) algorithm to demonstrate how it can be used for both classification and regression tasks. Illustrate the working steps involved in each case with suitable examples. 11 K3 CO4
- OR**
- b) Use the concept of a KD-tree to show how it improves the efficiency of finding nearest neighbors in multidimensional data. Describe the steps involved in constructing a KD-tree with an example. 11 K3 CO4
27. a) Explain the Vector Space Model in Information Retrieval. How are documents and queries represented? Discuss the calculation of similarity between documents and queries and mention the advantages and disadvantages of this model. 11 K2 CO5
- OR**
- b) What is Parsing in Natural Language Processing? Explain different types of parsing techniques and their significance in understanding the structure of sentences. 11 K2 CO5
28. a) Explain the architecture of an Autonomous Agent. How does it enable decision-making? 11 K2 CO6
- OR**
- b) What is Speech Understanding? Describe the key components involved in speech recognition systems and explain the challenges in converting speech to meaningful text. 11 K2 CO6