

## B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

## Artificial Intelligence and Machine Learning

## 24AMPC301 - FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Regulations - 2024

Duration: 3 Hours

Max. Marks: 100

## PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

Marks K-Level CO

- |   | Marks | K-Level | CO  |
|---|-------|---------|-----|
| 1. Artificial Intelligence aims to enable machines to _____ and _____ like humans.<br>(a) think, learn                      (b) speak, paint                      (c) sleep, eat                      (d) play, rest  | 1     | K1      | CO1 |
| 2. Which of the following best describes a rational agent?<br>(a) Always takes random actions<br>(b) Always performs optimally based on its perception<br>(c) Acts without considering environment<br>(d) Ignores feedback  | 1     | K2      | CO1 |
| 3. The purpose of heuristic function $h(n)$ in informed search is to _____.<br>(a) Estimate the cost from current node to goal                      (b) Calculate total path cost<br>(c) Determine number of successors                      (d) Randomly choose next node          | 1     | K2      | CO2 |
| 4. Match the following:<br>A. A* Search → i. Combines path cost and heuristic<br>B. BFS → ii. Explores shallowest nodes first<br>C. DFS → iii. Explores deepest nodes first<br>D. Hill Climbing → iv. Uses gradient to find optimum   | 1     | K1      | CO2 |
| <b>Choices:</b><br>(a) A-i, B-ii, C-iii, D-iv                      (b) A-ii, B-i, C-iii, D-iv<br>(c) A-iv, B-ii, C-i, D-iii                      (d) A-iii, B-ii, C-iv, D-i   | 1     | K2      | CO3 |
| 5. Which of the following is a valid statement about knowledge representation?<br>(a) Represents only data structures                      (b) Stores knowledge for reasoning<br>(c) Does not involve inference                      (d) Used only for learning tasks               | 1     | K1      | CO3 |
| 6. Bayesian reasoning is primarily used to _____.<br>(a) Handle uncertainty                      (b) Represent linguistic data<br>(c) Store symbolic knowledge                      (d) Perform deterministic reasoning   | 1     | K2      | CO4 |
| 7. Which of the following statements about fuzzy logic is TRUE?<br>(a) It deals with absolute truth only                      (b) It represents reasoning with degrees of truth<br>(c) It cannot model uncertainty                      (d) It is equivalent to propositional logic | 1     | K2      | CO4 |
| 8. Which learning paradigm uses labeled data for training?<br>(a) Unsupervised learning                      (b) Reinforcement learning<br>(c) Supervised learning                      (d) Semi-supervised learning  | 1     | K2      | CO5 |
| 9. Which component of an Expert System applies reasoning rules to the knowledge base?<br>(a) Inference Engine                      (b) Knowledge Base                      (c) User Interface                      (d) Database   | 1     | K1      | CO6 |
| 10. Natural Language Processing is a field of AI that focuses on _____.<br>(a) Visual perception                      (b) Speech and text understanding<br>(c) Robotic motion control                      (d) Hardware automation  | 1     | K1      | CO6 |

## PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

- |   |   |    |     |
|---|---|----|-----|
| 11. Define an intelligent agent and list its key characteristics.                 | 2 | K1 | CO1 |
| 12. Compare simple reflex and model-based agents with an example.                 | 2 | K2 | CO1 |
| 13. Explain the properties of a good heuristic function.                          | 2 | K2 | CO2 |
| 14. State the difference between depth-first and breadth-first search strategies. | 2 | K2 | CO2 |

- |  |   |    |     |
|--|---|----|-----|
| 15. What is knowledge representation? Mention any two techniques used in AI.               | 2 | K2 | CO3 |
| 16. Demonstrate the structure of a semantic network with a simple diagram.                 | 2 | K2 | CO3 |
| 17. What is the role of conditional probability in Bayesian networks?                      | 2 | K1 | CO4 |
| 18. Differentiate between rule-based reasoning and case-based reasoning.                   | 2 | K2 | CO4 |
| 19. List the major components of an Expert System.   | 2 | K2 | CO5 |
| 20. Explain one real-world application of Expert Systems.                                  | 2 | K2 | CO5 |
| 21. Recall the basic phases involved in a machine-learning workflow.                       | 2 | K1 | CO6 |
| 22. List any four real-world applications of Artificial Intelligence in different domains. | 2 | K2 | CO6 |

**PART - C (6 × 11 = 66 Marks)**

Answer ALL Questions

- |   |    |    |     |
|---|----|----|-----|
| 23. a) Explain the characteristics and limitations of Artificial Intelligence systems with relevant examples.                 | 11 | K2 | CO1 |
| <b>OR</b>   |    |    |     |
| b) Compare various types of intelligent systems based on their structure, adaptability, and interaction with environments.    | 11 | K2 | CO1 |
| 24. a) Construct the <i>Water Jug</i> problem and demonstrate its solution using an appropriate state-space search technique. | 11 | K3 | CO2 |
| <b>OR</b>   |    |    |     |
| b) Identify the influence of different heuristic functions on the performance of informed search algorithms.                  | 11 | K3 | CO2 |
| 25. a) Summarize the effectiveness of semantic networks, frames, and ontologies in knowledge representation.                  | 11 | K2 | CO3 |
| <b>OR</b>   |    |    |     |
| b) Infer the use of predicate logic and inference mechanisms in designing a knowledge base for a real-world domain.           | 11 | K2 | CO3 |
| 26. a) Develop the functioning of a planning agent using STRIPS notation for a block-world scenario.                          | 11 | K3 | CO4 |
| <b>OR</b>   |    |    |     |
| b) Identify the importance of PDDL in automating planning and improving goal-directed problem solving.                        | 11 | K3 | CO4 |
| 27. a) Construct an Expert System model for soil-fertility prediction and explain its inference process.                      | 11 | K3 | CO5 |
| <b>OR</b>   |    |    |     |
| b) Develop an ethical framework for implementing Expert Systems in healthcare decision-making.                                | 11 | K3 | CO5 |
| 28. a) Illustrate how feature selection enhances model performance and interpretability in machine learning.                  | 11 | K2 | CO6 |
| <b>OR</b>   |    |    |     |
| b) Outline the contribution of Explainable AI (XAI) towards achieving transparency and accountability in AI systems.          | 11 | K2 | CO6 |