M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Second Semester

Industrial Safety Engineering

20PISPC205 / 24PISPC205 - MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE FOR INDUSTRIAL SAFETY

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K–Level	CO
1.	Which algorithm finds the most specific and most general hypotheses in version spaces?	1	K1	CO1

  (a) ID3 Algorithm   (b) Candidate Elimination Algorithm
  (c) K-Means Algorithm   (d) Q-Learning Algorithm

| 2. | Show what a leaf node in a decision tree represents: | 1 | K1 | CO1 |

  (a) A selected attribute   (b) A possible output class
  (c) An unexplored branch   (d) A heuristic rule

| 3. | Choose the correct description of a genetic algorithm: | 1 | K1 | CO2 |

  (a) A method that relies on gradient descent
  (b) A technique for defining logical rules
  (c) An algorithm inspired by natural evolution using selection, crossover, and mutation
  d) A linear classification model

| 4. | Show what Q-learning aims to learn in reinforcement learning: | 1 | K1 | CO2 |

  (a) The probability of data misclassification
  (b) The optimal mutation probability
  (c) The number of neurons required in each layer
  (d) The value of taking a specific action in a given state

| 5. | Define PROLOG in the context of AI languages: | 1 | K1 | CO3 |

  (a) A logic programming language used for reasoning and knowledge representation
  (b) A functional language used for symbolic math
  (c) A low-level language used for hardware control
  (d) A language designed only for image processing

| 6. | Show the main function of picture processing in artificial vision systems: | 1 | K1 | CO3 |

  (a) To identify and classify real-world objects   (b) To generate random images for testing
  (c) To convert audio signals into image files   (d) To select memory units for storage

| 7. | Find the objective of learning systems in AI: | 1 | K1 | CO4 |

  (a) To manually encode all rules
  (b) To enable machines to improve performance based on experience
  (c) To select the fastest hardware
  (d) To restrict adaptation in expert systems

| 8. | Choose the correct description of production rules: | 1 | K1 | CO4 |

  (a) A set of equations used only in neural networks
  (b) Logic statements used only in fuzzy inference
  (c) Memory units used in learning systems
  (d) IF–THEN structures used to represent expert system knowledge

| 9. | Select the learning method commonly used in back propagation networks: | 1 | K1 | CO5 |

  (a) Unsupervised learning   (b) Reinforcement learning
  (c) Supervised learning   (d) Manual tuning

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **14104**

10. Show how ML is used in worker health and safety compliance: *1*   *K1*   *CO6*
    (a) By monitoring workers using body posture recognition
    (b) By creating manual risk reports
    (c) By removing PPE from workers
    (d) By disabling alarm systems

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

11. Define concept learning with an example.	*2*	*K1*	*CO1*
12. List any two examples of inductive bias in learning algorithms.	*2*	*K1*	*CO1*
13. Compare linear and nonlinear network representations.	*2*	*K2*	*CO2*
14. Infer why temporal-difference learning is considered a bootstrapping method.	*2*	*K2*	*CO2*
15. Define short-term and long-term memory models.	*2*	*K1*	*CO3*
16. List two AI techniques used in game playing.	*2*	*K1*	*CO3*
17. Compare forward chaining from backward chaining.	*2*	*K2*	*CO4*
18. List the role of common-sense reasoning in fuzzy logic.	*2*	*K1*	*CO4*
19. Explain the importance of multilayer networks.	*2*	*K2*	*CO5*
20. Interpret how stochastic training differs from batch training.	*2*	*K2*	*CO5*
21. List the basic learning rule used in Hebbian learning.	*2*	*K1*	*CO6*
22. Define the effect of parameter tuning on training speed.	*2*	*K1*	*CO6*

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23. a) Demonstrate the operation of the candidate-elimination algorithm step by step.   *11*   *K2*   *CO1*

    OR

    b) Explain in detail about various perspectives and issues in machine learning.   *11*   *K2*   *CO1*

24. a) Explain multilayer feed forward networks and the back propagation algorithm.   *11*   *K2*   *CO2*

    OR

    b) Illustrate the reinforcement-learning interaction cycle using agent–environment diagrams.   *11*   *K2*   *CO2*

25. a) Construct a comparison of PROLOG and LISP features, semantics, and typical uses.   *11*   *K3*   *CO3*

    OR

    b) Build flow diagrams showing image enhancement, segmentation, and analysis in factory vision systems with respective to artificial vision.   *11*   *K3*   *CO3*

26. a) Identify the influence of human cognitive processes on AI knowledge representation.   *11*   *K3*   *CO4*

    OR

    b) Experiment with the logic-based languages and their use in AI development in Learning Systems.   *11*   *K3*   *CO4*

27. a) Examine various neural network architectures and their suitability for different tasks.   *11*   *K3*   *CO5*

    OR

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

b) Determine the architecture of back propagation network and their effectiveness in classification tasks. *11* *K3* *CO5*

28. a) Discuss common issues in parameter selection and methods to resolve them. *11* *K2* *CO6*

OR

b) Explain modifications made in back propagation network variations and their mathematical basis. *11* *K2* *CO6*