SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES (AUTONOMOUS)

QUESTION BANK

Year / Semester: III B.Tech VI Semester **Regulation: R23**

Subject and Code: 23MEC361T ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR MECHANICAL ENGINEERING

SYLLABUS

UNIT –1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND PROBLEM-SOLVING AGENT:

Problems of AI, AI technique, Tic–Tac–Toe problem. Intelligent Agents, Agents &environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, and issues in the design of search programs.

UNIT –2: SEARCH TECHNIQUES:

Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A*search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNIT –3: CONSTRAINT SATISFACTION PROBLEMS AND GAME THEORY:

Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimal search procedure, alpha-beta pruning, additional refinements, iterative deepening

UNIT –4: KNOWLEDGE &REASONING: STATISTICAL REASONING:

Probability an Bays‘Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, forward and backward reasoning.

UNIT –5: INTRODUCTION TO MACHINE LEARNING:

Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, cluster problems, Introduction to neural networks and deep learning.

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Max Marks: 10

S.No.	CO	Questions	BT
Unit I: (INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND PROBLEM- SOLVING AGENT)			
1	1	Define Artificial Intelligence and explain the major problems addressed in AI.	L1
2	1	Describe the concept of an intelligent agent and list different types of agents in AI	L1
3	1	Explain the Tic–Tac–Toe problem as an AI problem, highlighting how it can be represented and solved.	L2
4	1	Discuss the nature of environments in AI, including different types such as deterministic, stochastic, static, and dynamic environments.	L2
5	1	Illustrate how a goal-based agent operates in a given environment with a suitable real-world example.	L3
6	1	Apply the concept of state space search to formulate a water jug problem	L3
7	1	Analyze the structure of intelligent agents, explaining how perception, decision-making, and action are interconnected.	L4
8	1	Compare and analyze goal-based agents and utility-based agents, highlighting their advantages and limitations.	L4
9	1	Evaluate the effectiveness of AI techniques in solving complex real-world problems compared to traditional programming methods.	L5
10	1	Critically examine the issues involved in the design of search programs, including completeness, optimality, time, and space complexity.	L5

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S.No.	CO	Questions	BT
Unit II: (SEARCH TECHNIQUES)			
1	2	Define problem-solving agents and explain the process of searching for solutions in AI.	L1
2	2	List and describe the uniform search strategies, including Breadth First Search, Depth First Search, Depth Limited Search, and Bidirectional Search.	L1
3	2	Explain the working of Breadth First Search (BFS) and Depth First Search (DFS) with suitable examples.	L2
4	2	Discuss the concept of heuristic search strategies and explain how they differ from uninformed search methods.	L2
5	2	Apply A* search algorithm to solve a path-finding problem and demonstrate how optimal solutions are obtained.	L3
6	2	Illustrate the use of Greedy Best-First Search in solving a real-world problem such as route finding.	L3
7	2	Analyze the differences between Greedy Best-First Search and A* Search, highlighting their advantages and limitations.	L4
8	2	Compare and analyze uniform search strategies: BFS, DFS, DLS, and Bidirectional Search in terms of completeness, optimality, time, and space complexity.	L4
9	2	Evaluate the performance of memory-bounded heuristic search algorithms, discussing their suitability for large-scale problems.	L5
10	2	Critically examine local search algorithms in solving optimization problems.	L5
11	2	Develop a hybrid search approach combining heuristic and local search techniques to solve complex optimization problems, explaining its advantages.	L6

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S.No.	CO	Questions	BT
Unit III: (CONSTRAINT SATISFACTION PROBLEMS AND GAME THEORY)			
1	3	Define Constraint Satisfaction Problems. Explain their key components with examples.	L1
2	3	What is adversarial search? Describe its role in game-playing AI systems.	L1
3	3	Explain local search techniques for Constraint Satisfaction Problems. How do they differ from systematic search methods?	L2
4	3	Describe the Minimax algorithm. How does it determine optimal decisions in games?	L2
5	3	Demonstrate the use of alpha-beta pruning on a game tree and show how it reduces the number of nodes evaluated.	L3
6	3	Apply the Minimax algorithm to a simple two-player game tree and determine the optimal move.	L3
7	3	Examine the role of iterative deepening in adversarial search. How does it improve decision-making under time constraints?	L4
8	3	Analyze the performance of Minimax and Alpha-Beta pruning algorithms. Compare their efficiency in terms of time complexity.	L4
9	3	Evaluate different strategies used in game-playing AI. Which strategy is most effective for complex games and why?	L5
10	3	Critically evaluate local search methods for CSPs. Discuss their advantages and limitations in real-world applications	L5
11	3	Develop a CSP model for a real-world problem and propose a suitable local search strategy and justify your choice.	L6

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S.No.	CO	Questions	BT
Unit IV: (KNOWLEDGE &REASONING: STATISTICAL REASONING)			
1	4	Define probability and Bayes' Theorem. Explain their significance in statistical reasoning	L1
2	4	What are certainty factors? Describe their role in rule-based systems.	L1
3	4	Explain Bayesian Networks. How do they represent uncertain knowledge in AI systems?	L2
4	4	Discuss Fuzzy Logic. How does it differ from classical (crisp) logic?	L2
5	4	Illustrate forward and backward reasoning using a rule-based system with suitable examples.	L3
6	4	Apply Bayes' Theorem to a real-world problem involving uncertainty and interpret the results	L3
7	4	Analyze the differences between procedural and declarative knowledge. How are they represented in AI?	L4
8	4	Examine the Dempster–Shafer Theory. How does it handle uncertainty differently compared to probability theory?	L4
9	4	Critically evaluate certainty factors and fuzzy logic. Discuss their advantages and limitations in real-world applications	L5
10	4	Evaluate following knowledge representation techniques: Rule-based, logic programming and Bayesian networks. Which is most effective under uncertainty and why?	L5

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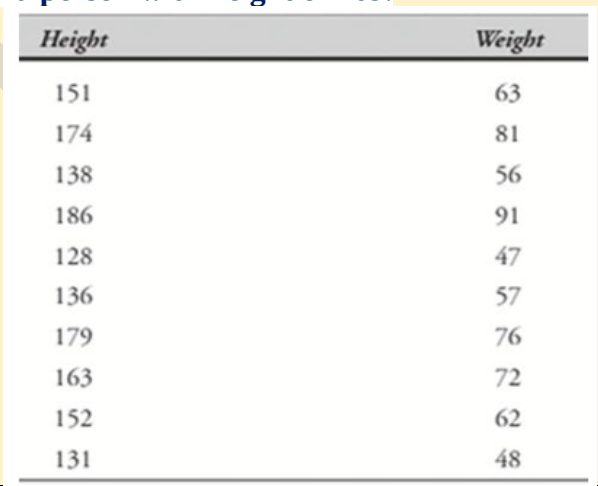
S.No.	CO	Questions	BT
		Unit V: (INTRODUCTION TO MACHINE LEARNING)	
1	5	**With suitable illustration describe the end-to-end process of machine learning lifecycle?**	L1
2	5	**Discuss the applications of Machine Learning across various domains such as healthcare, finance, manufacturing, and education.**	L1
3	5	**Explain supervised learning. How is it used to solve classification and regression problems?**	L2
4	5	**Discuss unsupervised learning. How does clustering differ from classification?**	L2
5	5	**Demonstrate clustering techniques for grouping data in an unsupervised learning scenario with an example.**	L3
6	5	**Compare and contrast Supervised, Unsupervised, and Reinforcement Learning with suitable examples.**	L4
7	5	**Analyze the differences between classification and regression problems. Provide suitable examples.**	L4
8	5	**Evaluate the effectiveness of reinforcement learning in decision-making problems. Discuss real-world applications.**	L5
9	5	**Develop a basic neural network model for solving a classification problem. Explain its architecture and how learning enhances performance.**	L6
10	5	**Compute the correlation coefficient for the given dataset; and find the relation between height and weight of ten students. Also predict the weight of a person with height of 169.** 	L3

Height	*Weight*
151	63
174	81
138	56
186	91
128	47
136	57
179	76
163	72
152	62
131	48

Note: L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, and L6-Creating

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TEXT BOOKS:

1. **Artificial Intelligence: A Modern Approach**, Stuart Russell and Peter Norvig, Prentice Hall, 3rd Edition, 2015.
2. **Artificial Intelligence: A New Synthesis,** Nils J. Nilsson, Morgan Kaufmann Publishers, 1st Edition, 1998.

REFERENCE BOOKS:

1. **Artificial Intelligence**, Elaine Rich, Kevin Knight, and Shiva Shankar B. Nair, McGraw Hill, 3rd Edition, 2017.
2. **Introduction to Artificial Intelligence and Expert Systems,** D. W. Patterson, Pearson Education, 1st Edition, 2015.
3. **Logic and Prolog Programming,** Saroj Kaushik, New Age International Publishers, 1st Edition, 2002.
4. **Expert Systems: Principles and Programming,** Joseph C. Giarratano and Gary D. Riley, 4th Edition, 2007.

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