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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 130013

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025

Fifth Semester

Electrical and Electronics Engineering

U23CTOE1 – FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

(Common to ECE & BT)

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels	K1 – Remembering	K3 – Applying	K5 - Evaluating
(KL)	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define Artificial Intelligence in the context of rational agent design. How does this differ from a human-based definition of AI?	2	K2	CO1
2.	Outline the role of the Turing Test in defining Artificial Intelligence. What are its limitations in modern AI research?	2	K1	CO1
3.	Explore the concept of heuristics in AI search algorithms. Why is heuristic design considered a challenging task?	2	K2	CO2
4.	Differentiate between best-first search and A* search.	2	K1	CO2
5.	Discuss the term control strategy in state space search. Give an example using a classic problem.	2	K2	CO3
6.	How the concept of a bounded look-ahead strategy is relevant in game playing?	2	K2	CO3
7.	Describe the minimax algorithm used in game playing. Mention how alpha-beta pruning enhances the minimax search.	2	K2	CO4
8.	What is the significance of the minimax algorithm in game playing ?	2	K2	CO4
9.	Write the general form of a Horn clause and write its importance in logic programming.	2	K2	CO5
10.	What is the difference between forward chaining and backward chaining inference?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Explain the foundations of Artificial Intelligence and describe how various sub-areas contribute to the overall goal of intelligent behavior.	13	K2	CO1
	(OR)			
b)	Describe the architecture of an intelligent agent. How do perception, reasoning, learning, and action modules interact within this architecture?	13	K2	CO1
12. a)	Analyze the problem-solving paradigm in AI using state space search. Illustrate the answer with an example of the A* search algorithm and explain its heuristic evaluation.	13	K2	CO2
	(OR)			
b)	Describe the concept of state space representation with a suitable example (e.g., 8-puzzle or water jug problem). How does the choice of control strategy affect search performance?	13	K2	CO2
13. a)	Explain bounded look-ahead strategy. Describe how it is applied in game playing to limit computational resources while maintaining competitive performance.	13	K2	CO3
	(OR)			
b)	How the concept of semantic is used in AI? Discuss the inference rules and unification for semantic. Give any example of Logic Based Application.	13	K2	CO3
14. a)	Discuss how game playing serves as a testing ground for AI techniques. Include references to search, heuristic evaluation, and learning from gameplay.	13	K3	CO4
	(OR)			
b)	Explore the idea of “Conceptual Graph” in AI developing representational scheme. What are the number of operations used in “Conceptual Graph”? Give a detailed description for the same with an application.	13	K3	CO4
15. a)	Differentiate between propositional logic and predicate logic. Provide examples of how each can represent real-world knowledge.	13	K3	CO5
	(OR)			
b)	Explain how logic-based AI systems differ from heuristic or learning-based systems in terms of interpretability and generalization.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	<p>An autonomous delivery robot is designed to navigate through a warehouse to deliver packages between different stations. The warehouse layout can be represented as a grid map, where some cells are blocked (obstacles) and others are traversable. The robot must find the shortest and safest route from its starting position to the target station while avoiding obstacles.</p> <p>To achieve this, the designers are considering implementing A* search with an appropriate heuristic function. However, the system also needs to respond efficiently in real time when new obstacles appear or when the robot's sensors detect changes in the environment. Based on the case study, answer the following questions:</p> <ol style="list-style-type: none"> 1. Represent this problem as a state space search problem by defining the state representation, initial state, goal state, and operators. (3) 2. Explain how the A* algorithm would find the optimal path in this scenario. What role does the heuristic function play? (3) 3. Suggest a suitable heuristic for this pathfinding problem and justify its admissibility and consistency. (3) 4. If real-time constraints exist, explain how a bounded look-ahead strategy or iterative deepening A* could be applied. (3) 5. Discuss how this problem illustrates the foundational principles of AI and connects with sub-areas such as robotics, perception, and reasoning. (3) <p style="text-align: center;">(OR)</p>	15	K2	CO2
b)	<p>A research team is developing an AI agent to play a simplified version of Tic-Tac-Toe autonomously. The agent must make rational moves, predict the opponent's possible moves, and aim for an optimal winning strategy. The design integrates both logic programming (Prolog) and heuristic search methods. Based on your understanding, answer the following:</p> <ol style="list-style-type: none"> 1. Formulate the game as a state space search problem. Identify the initial state, goal state, and possible operators (moves). (3) 	15	K2	CO3

2. Describe how the minimax algorithm and alpha-beta pruning can be used by the agent to optimize decision-making. (3)
 3. Propose a heuristic evaluation function that estimates the desirability of a game state when a full search is computationally infeasible. (3)
 4. Explain how logic programming (using Prolog) could be employed to represent the game rules and infer valid moves. (3)
 5. Discuss how this case demonstrates the integration of logic, heuristic search, and control strategies in building an intelligent system, emphasizing how it aligns with the foundational goals of AI. (3)
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