B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E.   Semester: V

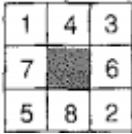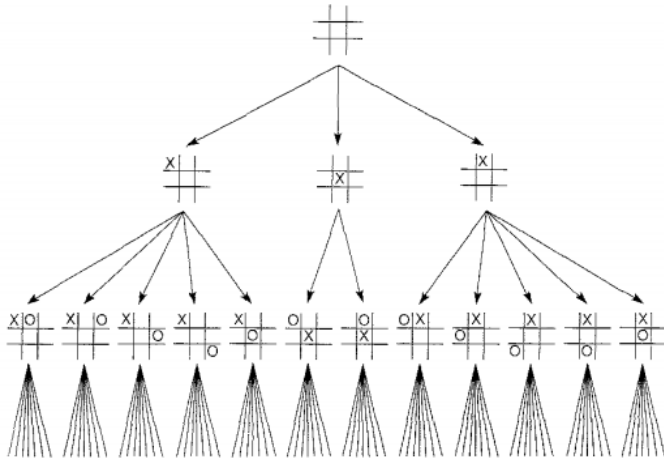Branch: Electronics and Communication Engineering   Duration: 3 hrs.
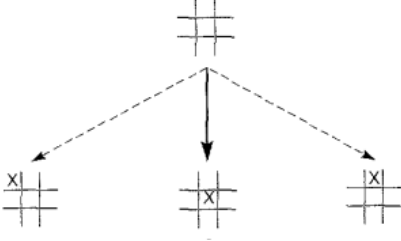
Course Code: 23EC5PE1AI / 22EC5PE1AI   Max Marks: 100

Course: Introduction to AI

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	CO	PO	Marks
1	a)		How do modules such as perception, reasoning, problem solving and action coordination contribute to the overall functionality of the AI system? Discuss the components and architecture of an intelligent system.	CO 2	PO 1	**08**
	b)		What are Artificial Intelligence and Intelligence systems? Briefly explain how AI Technique can be represented and list out any three task domains of AI systems.	CO 2	PO1	**12**
			OR			
2	a)		Define intelligence and discuss how it has been traditionally measured. How does Artificial Intelligence aim to replicate or simulate human intelligence?	CO 2	PO1	**08**
	b)		Discuss any three real-world applications of Artificial Intelligence in different sectors such as healthcare, finance, and transportation. How have these applications impacted society?	CO 2	PO1	**12**
			UNIT - II			
3	a)		Analyze the syntax and semantics of predicate calculus along with its significance as a representation language for artificial intelligence. Provide examples to support your discussion.	CO3	PO2	**10**
	b)		Compare the predicate calculus with the propositional calculus, highlighting the advantages and capabilities that predicate calculus offers for representing the reasoning about properties of relationships in the world. Provide a critical analysis of the differences between these two formalisms.	CO3	PO2	**10**

			OR			
	4	a)	Explain the concept of the state space in the context of the 8-puzzle problem generated by "move blank" operations as given in Figure 01. Analyze how the state space representation captures all possible configurations of the puzzle and discuss the significance. Provide examples to illustrate the state transitions and the role of legal moves in navigating the state space of the 8-puzzle.	*CO3*	*PO2*	**10**

Figure 01. Eight puzzle game

		b)	How can a state-space search algorithms are used to solve the 3-jug water jug problem with capacities of 8L, 5L, and 3L (where the 8L jug is initially full), to achieve a final state where two jugs contain exactly 4L each, and what is the optimal sequence of actions required?	*CO3*	*PO2*	**10**
			UNIT - III			
	5	a)	Illustrate the concept of heuristic search and its significance in problem-solving for the state space diagram shown in figure 02. Provide any two examples of heuristic search algorithms.	*CO 2*	*PO1*	**10**

Figure 02

		b)	Analyze the A and A* algorithms for implementing best-first search. How do these algorithms optimize the search process in state space exploration? Explain any two processes.	*CO3*	*PO2*	**10**
			OR			
	6	a)	Describe the key properties of admissibility, monotonicity, and informedness in the context of heuristic search algorithms. Why these properties are important, provide the analysis report?	*CO 2*	*PO1*	**10**

		b)	The "most wins" heuristic applied to the first children in tic-tac-toe is shown in the figure 03 below. Draw the Heuristically reduced state space and analyses the reduced search after three steps in the game by marking their heuristic values. Figure 03.	*CO3*	*PO2*	**10**
			UNIT - IV			
7	a)		Explain the architecture of expert systems with all components. Discuss the role of knowledge base, inference engine, and user interface in their operation.	*CO 2*	*PO1*	**10**
		b)	Discuss the challenges of maintaining and updating knowledge bases in expert systems over time. Analyze strategies for ensuring the relevance and accuracy of the knowledge stored.	*CO3*	*PO2*	**10**
			OR			
8	a)		Discuss the any two applications of expert systems in real-world scenarios, providing examples of industries or medical domains where expert systems have successfully deployed.	*CO 2*	*PO1*	**10**
		b)	Compare and analyse expert systems with traditional programming approaches, highlighting the advantages and limitations of using expert systems for problem-solving.	*CO3*	*PO2*	**10**
			UNIT - V			
9	a)		Illustrate the fundamental principles of Particle Swarm Optimization (PSO) and how it mimics the behavior of birds in nature. Apply PSO to solve a complex optimization problem and describe the steps involved in the optimization process.	*CO3*	*PO2*	**08**
		b)	Illustrate the process of crossover in a Genetic Algorithm using a binary representation of individuals. Consider two parent individuals with binary strings 101101 and 110011. Perform a single-point crossover at position 3 to create two offspring. Show the resulting offspring after crossover.	*CO 2*	*PO1*	**06**
		c)	Demonstrate the role of fitness function in genetic algorithm and show how it affects the search process in GA.	*CO 2*	*PO1*	**06**
			OR			
10	a)		Analyze the process and effectiveness of applying Genetic algorithms to maximize the he function $F(x)=x^2+2x$ where x is	*CO3*	*PO2*	**08**

			a real number in the range [0,31]. Use a Genetic Algorithm with a population size of five individuals to maximize the function $F(x)$ within the given range.			
		b)	Discuss the role of pheromone updating in Ant Colony Optimization (ACO). Illustrate how it enables the algorithm to converge towards better solutions over time.	*CO 2*	*PO1*	**12**

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