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

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E.   **Semester: III**
Branch: Artificial Intelligence & Data Science   **Duration: 3 hrs.**
Course Code: 23AI3PCIAI   **Max Marks: 100**
Course: Introduction to Artificial Intelligence
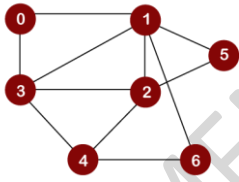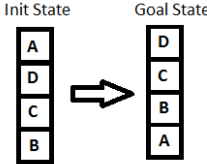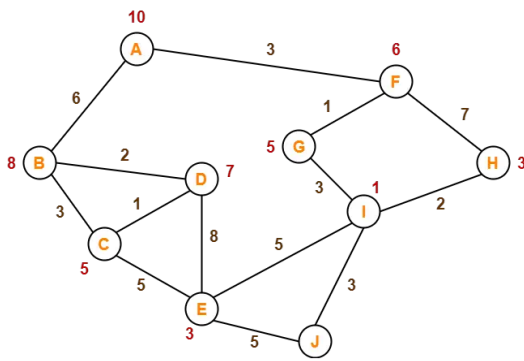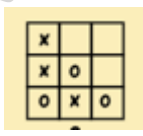
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
　　　　　　　　2. Missing data, if any, may be suitably assumed.

<div style="writing-mode: vertical">**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.</div>

			UNIT - I	CO	PO	Marks
1	a)		Describe rational agent and its interaction with environment	CO1	PO1	**05**
	b)		Apply depth first search and breadth first search algorithm for the given graph. Discuss time and space complexity of these algorithms. Which algorithm functions more effectively? Justify your answer. 	CO2	PO2	**05**
	c)		Imagine you have a robotic vacuum cleaner named "RoboClean". RoboClean is designed to clean two rooms, Room A and Room B, in your house. The rooms can get dirty over time, and RoboClean's job is to ensure both rooms are clean.Write a program to implement CleanBot, your intelligent cleaning assistant, ensuring that both the rooms are thoroughly cleaned.	CO3	PO3	**10**
			UNIT - II			
2	a)		Solve the following problem using Hill Climbing algorithm h(x) = +1 for all the blocks in the correct structure if the block is correctly positioned otherwise -1 for all the blocks in the support structure. 	CO2	PO2	**10**

		b)	Write A* search algorithm. Apply A* algorithm on the following graph and Find the most cost-effective path to reach from start state A to final state J using A* Algorithm. *Note: The numbers written on nodes represent the heuristic value.*	CO2	PO2	**10**
			UNIT - III			
3		a)	Apply Alpha beta pruning algorithm to solve tic tac toe game.	CO2	PO2	**10**
		b)	You're tasked with solving a Constraint Satisfaction Problem (CSP) using a Python program implementing backtracking search. Your CSP involves assigning values to variables A, B, and C from the domains [1, 2, 3], ensuring no two variables share the same value. Apply backtracking search to find a valid assignment satisfying all the constraints. Also give a note on value ordering and variable selection.	CO3	PO2	**10**
			OR			
4		a)	Select the next move for MAX using minimax (putting a X). Use utility value +1 for winning the game, -1 for losing the game and 0 for draw. 	CO2	PO3	**10**
		b)	Write an algorithm for a straightforward stochastic game in which two players alternate rolls of a fair six-sided dice. After a predetermined number of rounds, the player with the greatest cumulative score prevails. Provide a clear diagram to explain the stochastic game.	CO3	PO3	**10**
			UNIT - IV			
5		a)	Convert the following statements into First-order logic (FOL) and write the same in conjunctive normal form (CNF) form. Clearly show all the steps: First, a brick is on something that is not a pyramid; second, there is nothing that a brick is on and that is on the brick as well; and third, there is nothing that is not a brick and also is the same thing as the brick.	CO3	PO4	**10**

		b)	Problem Statement: - 1. Ravi likes all kind of food. 2. Apples and chicken are food 3. Anything anyone eats and is not killed is food 4. Ajay eats peanuts and is still alive 5. Rita eats everything that Ajay eats Prove by resolution that " Ravi likes peanuts".	CO2	PO2	**10**
			OR			
6	a)		Write the forward chaining algorithm for first order logic. Construct the proof tree using forward chaining for the statement "West is the Criminal". Use the following first order definite clauses to solve: American(X), Weapon(Y) Sells(X,Y,Z) Hostile(Z) Criminal(X) Owns(Nono,M1) and Missile(M1) Missile(X), Owns(Nono, X), Sells(West, X, Nono) Missile(X), Weapon(X) Enemy(X, America), Hostile(X) American(West) Enemy(Nono, America)	CO3	PO4	**10**
	b)		Consider the Wumpus world problem below: Assume that the agent has moved from room [1, 1], to room [2,1] Prove that Wumpus is in the room [1, 3].	CO2	PO2	**10**
			UNIT - V			
7	a)		Given the full joint distribution as shown in table below, calculate the following: a. P(Toothache) b. P(Cavity)c. P(Toothache | Cavity) d. P(Cavity | Toothache ∨ Catch)	CO3	PO4	**10**

	toothache		¬toothache	
	catch	¬catch	catch	¬catch
cavity	0.108	0.012	0.072	0.008
¬cavity	0.016	0.064	0.144	0.576

		b)	In a survey conducted among a group of individuals, it was found that 70% of those who tested positive for a certain disease actually had the disease, while 90% of those who tested negative were disease-free. The disease prevalence in the population is 5%. a. If an individual tests positive for the disease, what is the probability that they actually have the disease? (Use Bayes' rule) b. If an individual tests negative for the disease, what is the probability that they are disease-free? (Use Bayes' rule)	CO3	PO4	**10**

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